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The AUTOMOBILE

# Automobiles Now Form 59 Per Cent. of Massachusetts' Vehicles

## Actual Counts Made on Public Highways Reveal Relative Proportions of Horse-Propelled and Automobile Traffic—Second Census, Made in 1912, Indicates Big Increase in Automobiles Over Number Recorded in 1909

By James T. Sullivan

BOSTON, MASS., Feb. 14—Traffic census is the necessary foundation for true and just traffic taxation. It is impossible to know just how much of the road maintenance cost should be borne by the automobile public unless the relative destructive effects of horse-drawn and horseless vehicles are determined by actual count and experimentation. Therefore, any activity tending to shed light upon this question deserves the full support of automobilists.

It is significant and not a matter of chance that New England leads in this work of determining the relative effect of horse and motor traffic upon public highways. The Northeast, prominent both as a user of pleasure and commercial cars, and evidencing its progressive constitution by the use of these vehicles, is necessarily the leader in this work. Among the New England states, Massachusetts leads in progressive spirit, and Massachusetts it was that first introduced practically the idea of counting horse and motor vehicles. This state, in which at present one person in every fifty-nine owns an automobile, naturally recognized the importance of the problem before any others did so. Consequently, in 1909, the authorities planned and executed a scheme for arriving at a fairly exact knowledge of the relative proportions of the two kinds of road vehicles. In 1912 the second census was taken.

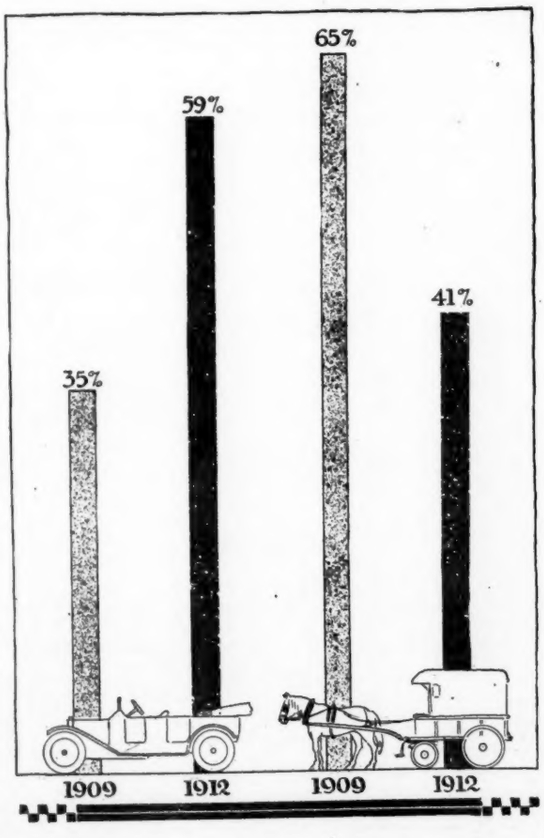
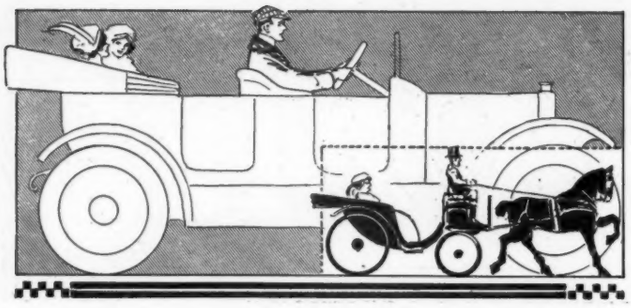



Diagram illustrating the comparative percentage of horse-drawn and self-propelled vehicles which traversed the roads of Massachusetts during the months of October, 1909, and October, 1912, according to count by observers of the state highway commission

The method of procedure used to obtain this information being described below, it remains but to bring out a few principal results of the investigation. The first census showed that of the vehicles counted on the highways of the state 35 per cent. were automobiles and 65 per cent. horse-drawn. In 1912 59 per cent. of the traffic was self-propelled and only 41 per cent. utilized the tractive effort derived from real horsepower. This alone shows the tremendous increase of the automobile in Massachusetts. The actual numbers are not of such importance, as they vary in proportion to the number of counting stations, of which there were more in 1909 than in 1912.

The advocates of horse traffic, that is, the owners of horse-drawn vehicles, would, of course, argue that there being more automobiles than horse-drawn vehicles, automobiles as a whole and each car in particular, should pay higher taxes than horse vehicles, or the whole expense of road maintenance. They forget, however, the different effects of horses' hoofs and automobile wheels upon the road. A horse, in moving over a road,



In August, 1912, the road traffic in Boston parks showed a ratio of one horse-drawn vehicle to four automobiles

destroys the roadbed as effectively as only a horseshoe can do it. Steel formed with rectangular edges, driven by vertical fall into the surface, still more depressed to give the fulcrum about which the weight of the horse body is thrown forward. On the other hand, the automobile wheel, shod with elastic rubber, forming an almost perfect ring which gradually engages at every instant the road, without leaving it, and always applying the driving force in a direction almost parallel to the horizontal direction of travel. It would be worth while to make tests of this situation for once; running a horse-drawn wagon over a sample stretch of road, and then an automobile over a similar stretch; no doubt the result would be interesting to both automobile and horse-vehicle users, but more gratifying to the former than the latter.

As a matter of fact, while it cannot be denied that automobiles traveling at high speed do destroy the roadbed to some extent by the adhesion of the tires which lasts a very short space longer than the actual driving engagement of the tire surface with the road, a very different situation obtains when the car is traveling at moderate speed. In this case the above mentioned tearing effect of the tires on the road is practically nil, and to a certain extent they act even as rollers which assist in the setting of the road material on the foundation. Now, as an overwhelming majority of automobiles on American roads travel at a normal speed no greater than 30 miles an hour, the beneficial effect of this road traffic by far exceeds the destructive efforts of high speed vehicles.

A study of the following report on the recent Massachusetts vehicle census will bring out the facts that in the methods employed there is room for more than one improvement, and it is up to automobilists' organizations to discover such and bring about their practical introduction in vehicle census work. All, however, will admit that the census idea is meritorious.

It may be said that there are two very good reasons why comparative figures relative to traffic over the roads of Massachusetts are of interest at the present time. One reason is the fact that there is agitation in a number of states to increase the fees for motor trucks, and already legislation to that end has been considered in Massachusetts and will be enacted at this session of the Legislature. The other reason is that states elsewhere may get some idea of what a traffic census will reveal, and as it is an intelligent way to get at the real damage done to highways because of the use of the roads by vehicles it will save states lots of money by delving into it as Massachusetts has done. Once the effects of various kinds of traffic are known, authorities will cease to consider the automobile public free game.

The first census was taken in 1909 and another was taken last year so that they were just 3 years apart. The Massachusetts Highway Commission worked out and carried on the census. It was decided that as August was a month when about everyone was on the roads it would be the best on which to get the abnormal traffic, while October would be the better for getting the ordinary traffic figures. So six days were picked out in the middle of each month, and in 1909 the commission planted men at 237 stations on the various highways of the state in August and at 240 stations in October, divided into five sections.

## TABLE SHOWING RESULTS OF MASSACHUSETTS TRAFFIC CENSUS IN BOSTON AND VICINITY

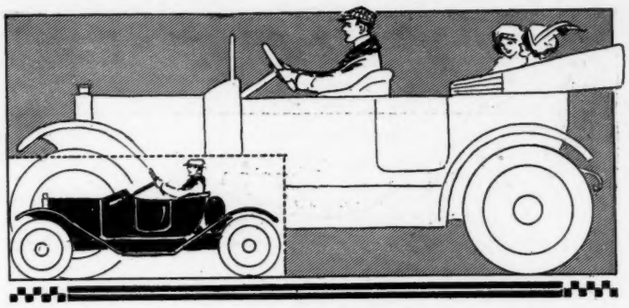
| | HORSEDRAWN | | | | AUTOMOBILES | | | TOTALS | | | | | PERCENTAGES | | | | AVERAGE NUMBER OF VEHICLES | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Single Horse | | Two or More | | | | | Horsedrawn | | | | | Horse-drawn | | | | Horse-drawn | | | | | |
| | Light | Heavy | Light | Heavy | Runabouts | Touring Cars | Trucks, Omnibus | Light | Heavy | All | Automobiles | All Kinds | Light | Heavy | All | Automobiles | Light | Heavy | All | Automobiles | All Kinds | Number of Stations |
| **August, 1909** | | | | | | | | | | | | | | | | | | | | | | |
| *Night Traffic. | 154 | 180 | 7 | 86 | 109 | 426 | Not | 161 | 266 | 427 | 535 | 962 | 17 | 28 | 45 | 55 | 13 | 22 | 36 | 45 | 80 | 12 |
| Metropol. Pk.. | 973 | 372 | 69 | 242 | 1,130 | 4,245 | c'nt- | 1,042 | 614 | 1,656 | 5,375 | 7,031 | 15 | 9 | 24 | 76 | 208 | 123 | 331 | 1,075 | 1,407 | 5 |
| Boston Park.. | 616 | 109 | 136 | 78 | 444 | 2,641 | ed in | 752 | 187 | 939 | 3,085 | 4,024 | 18 | 5 | 23 | 77 | 250 | 62 | 313 | 1,028 | 1,341 | 3 |
| Newton..... | 428 | 557 | 30 | 172 | 287 | 775 | 1909 | 458 | 729 | 1,187 | 1,062 | 2,249 | 20 | 32 | 52 | 48 | 114 | 182 | 297 | 265 | 562 | 4 |
| **August, 1912** | | | | | | | | | | | | | | | | | | | | | | |
| *Night Traffic. | 42 | 125 | 4 | 86 | 38 | 133 | 27 | 46 | 211 | 257 | 189 | 455 | 10 | 46 | 56 | 44 | 14 | 70 | 85 | 66 | 151 | 3 |
| Metropol. Pks. | 516 | 470 | 34 | 327 | 1,829 | 8,036 | 189 | 550 | 797 | 1,347 | 10,054 | 11,401 | 5 | 7 | 12 | 88 | 69 | 100 | 169 | 1,256 | 1,425 | 8 |
| Boston Parks. | 319 | 308 | 94 | 311 | 893 | 3,778 | 369 | 413 | 619 | 1,032 | 5,020 | 6,052 | 7 | 10 | 17 | 83 | 138 | 206 | 344 | 1,673 | 2,017 | 3 |
| **October, 1909** | | | | | | | | | | | | | | | | | | | | | | |
| Metropol. Pk.. | 708 | 394 | 58 | 221 | 776 | 2,571 | Not | 766 | 615 | 1,381 | 3,347 | 4,728 | 16 | 13 | 29 | 71 | 153 | 123 | 276 | 669 | 946 | 5 |
| Boston Park.. | 686 | 213 | 256 | 65 | 633 | 2,608 | c'd in | 942 | 278 | 1,220 | 3,241 | 4,461 | 21 | 6 | 27 | 73 | 314 | 93 | 407 | 1,080 | 1,120 | 3 |
| Newton..... | 126 | 120 | 13 | 40 | 134 | 513 | 1909 | 139 | 160 | 299 | 667 | 946 | 15 | 17 | 32 | 68 | 35 | 40 | 75 | 162 | 236 | 4 |
| **October, 1912** | | | | | | | | | | | | | | | | | | | | | | |
| *Night Traffic. | 47 | 182 | 6 | 108 | 44 | 20. | 33 | 53 | 290 | 343 | 280 | 623 | 8 | 47 | 55 | 45 | 11 | 58 | 69 | 56 | 125 | 5 |
| Metropol. Pks. | 603 | 480 | 30 | 300 | 1,554 | 6,45: | 358 | 633 | 780 | 1,413 | 8,363 | 9,776 | 6 | 8 | 14 | 86 | 79 | 98 | 177 | 1,045 | 1,222 | 8 |
| Boston Parks. | 716 | 450 | 217 | 205 | 1,279 | 2,34? | 721 | 933 | 655 | 1,588 | 4,347 | 5,935 | 16 | 11 | 27 | 73 | 311 | 218 | 529 | 1,449 | 1,978 | 3 |
| Swampscott.... | 139 | 270 | 7 | 60 | 207 | 499 | 46 | 146 | 330 | 476 | 752 | 1,228 | 12 | 27 | 39 | 61 | ..... | ..... | ..... | ..... | ..... | 1 |

*One night only.

These men were given cards to tabulate all vehicles that passed a given point between 7 a. m. and 9 p. m. In 1909 they tabulated the vehicles, dividing them into horse-drawn, light and heavy, using one, two or more horses. The motor cars were divided into runabouts and touring cars. As motor trucks were not much in evidence in 1909 they were omitted that year, but they were included in 1912. Not only were the highways under state supervision watched, but also the park system, the Metropolitan, which takes in a radius of about 10 miles around Boston; the Boston park department, and a few roads on the outskirts.

When the census was taken in 1912 the number of stations were reduced to 155 and held into four divisions. But practically as much mileage was covered in 1912 for the stations were a little further apart, the commission having had the experience of the previous census to guide them in placing the stations. The map given on page 498 shows the divisions according to 1912. The first of these began up at the northwest corner of the state near the New York and Vermont line and sweeping down through the Berkshires toward Connecticut, passed through the principal towns and the larger cities, then turned easterly toward the center of the state. This route takes in the more traveled through roads leading to New York and there were thirty-eight stations on it. Division 2 began at about the same place, but went easterly in a more direct line to the center of the state. It had fifteen stations. Both of these routes took in the mountainous part of the Bay State. And the Division 2 was also a through route branching off to allow motorists to go through New Hampshire in the southwestern portion and the southern part of Vermont.

Division 3 took in the most populous section of all. This



**Showing the ratio of large cars to runabouts, about four and a half to one, in Massachusetts last year**

route, or these routes, radiated from Boston to Worcester on the west in the middle of the state and also took in the whole northeastern part, which comprises the famous North Shore district where thousands go to spend the summer; and over the routes used going to and from the White Mountains and the resorts in Maine. The section is flat and the roads are good. On this section there were established fifty-three stations in August and fifty-six in October. Division 4, while not so populous as Division 3, is nevertheless very well peopled and it comprised the southeastern section of the state extending to Cape Cod from Boston. In this place, like in Division 3, there are a number of cities and many towns. In fact, the greater part of the population by far are centered in these divisions. The land in the last division is level or rolling, and more of a sandy nature. There

## SHOWING RESULTS OF MASSACHUSETTS TRAFFIC CENSUS IN THE FOUR STATE DIVISIONS

### August—6 Days—7 A.M. to 9 P.M.—1909 Traffic Census Figures

| | HORSEDRAWN | | | | AUTOMOBILES | | | TOTALS | | | | | PERCENTAGES | | | | AVERAGE NUMBER OF VEHICLES | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Single Horse | | Two or More | | | | | Horsedrawn | | | | | Horse-drawn | | | | Horse-drawn | | | | | |
| | Light | Heavy | Light | Heavy | Runabouts | Touring Cars | Trucks, Omnibus | Light | Heavy | All | Automobiles | All Kinds | Light | Heavy | All | Automobiles | Light | Heavy | All | Automobiles | All Kinds | Number of Stations |
| Div. 1 | 1,464 | 688 | 201 | 618 | 362 | 1,475 | Not | 1,665 | 1,306 | 2,971 | 1,837 | 4,808 | 35 | 27 | 62 | 38 | 67 | 52 | 119 | 73 | 192 | 25 |
| Div. 2 | 2,947 | 1,173 | 165 | 795 | 434 | 1,335 | count | 3,112 | 1,968 | 5,080 | 1,796 | 6,849 | 45 | 29 | 74 | 26 | 107 | 68 | 175 | 61 | 236 | 29 |
| Div. 3 | 2,595 | 1,690 | 209 | 1,144 | 695 | 2,571 | ed | 2,804 | 2,834 | 5,638 | 3,266 | 8,904 | 31 | 32 | 63 | 37 | 59 | 60 | 119 | 70 | 189 | 47 |
| Div. 4 | 6,251 | 4,603 | 323 | 2,304 | 2,756 | 9,083 | in | 6,574 | 6,907 | 13,481 | 11,839 | 25,320 | 26 | 27 | 53 | 47 | 85 | 90 | 175 | 154 | 329 | 77 |
| Div. 5 | 5,263 | 3,804 | 204 | 1,150 | 1,675 | 6,923 | 1909 | 5,467 | 4,954 | 10,421 | 8,598 | 19,019 | 29 | 26 | 55 | 45 | 93 | 84 | 177 | 146 | 323 | 59 |
| Totals | 18,520 | 11,958 | 1,102 | 6,011 | 5,922 | 21,387 | | 19,622 | 17,969 | 37,591 | 27,309 | 64,900 | †30 | 28 | 58 | 42 | 83 | 76 | 159 | 115 | 274 | 237 |

### August—6 Days—7 A.M. to 9 P.M.—1912

| | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Div. 1 | 1,923 | 1,378 | 247 | 878 | 1,056 | 5,844 | 369 | 2,170 | 2,265 | 4,435 | 7,269 | 11,704 | 18 | 20 | 38 | 62 | 57 | 60 | 117 | 191 | 308 | 38 |
| Div. 2 | 884 | 334 | 32 | 247 | 267 | 1,282 | 44 | 916 | 581 | 1,497 | 1,593 | 3,090 | 29 | 19 | 48 | 52 | 61 | 39 | 100 | 106 | 206 | 15 |
| Div. 3 | 2,568 | 2,707 | 166 | 1,250 | 2,875 | 13,839 | 835 | 2,734 | 3,957 | 6,691 | 17,549 | 24,240 | 11 | 16 | 27 | 73 | 52 | 74 | 126 | 331 | 457 | 53 |
| Div. 4 | 3,431 | 2,850 | 69 | 836 | 2,357 | 11,107 | 516 | 3,500 | 3,686 | 7,186 | 13,980 | 21,166 | 17 | 17 | 34 | 66 | 72 | 75 | 147 | 285 | 432 | 49 |
| Totals | 8,806 | 7,278 | 514 | 3,211 | 6,555 | 32,072 | 1,764 | 9,320 | 10,489 | 19,809 | 40,391 | 60,200 | †16 | 17 | 33 | 67 | 60 | 68 | 128 | 260 | 388 | 155 |

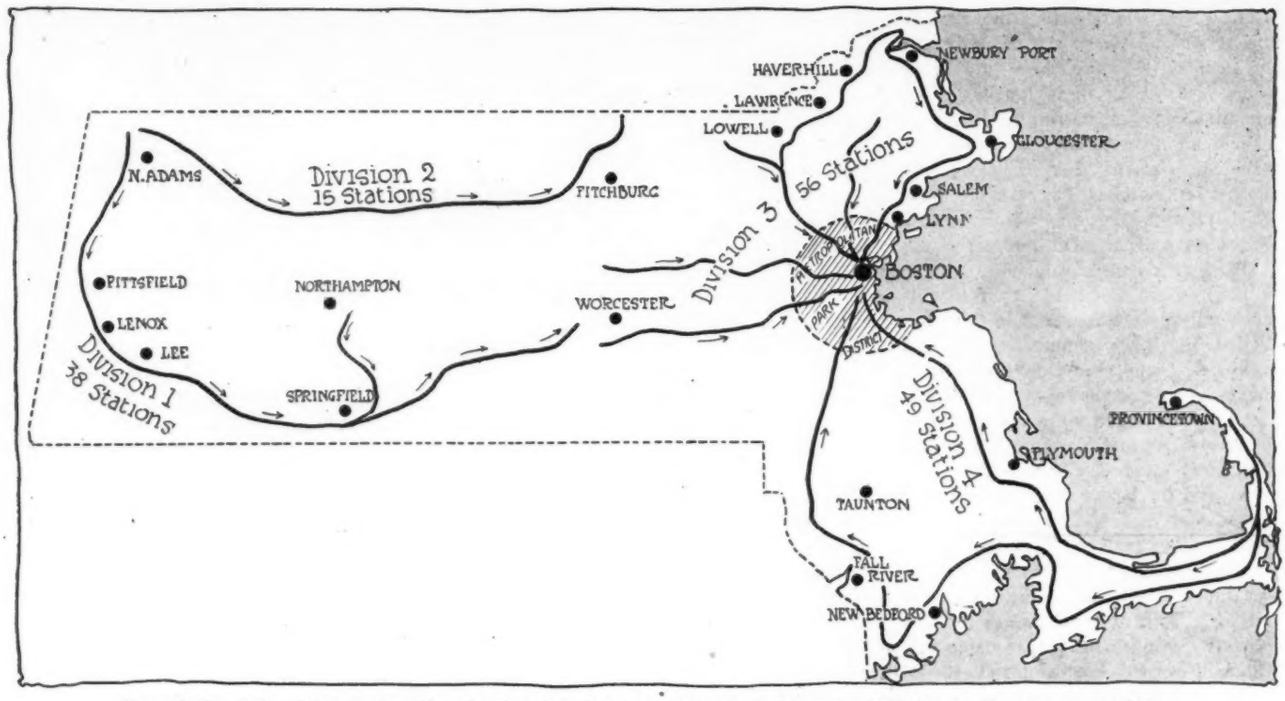
### October—1909—6 Days—7 A.M. to 9 P.M.

| | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Div. 1 | 1,254 | 730 | 175 | 779 | 289 | 1,473 | Not | 1,429 | 1,509 | 2,938 | 1,762 | 4,700 | 30 | 32 | 62 | 38 | 55 | 58 | 113 | 68 | 181 | 26 |
| Div. 2 | 2,644 | 1,204 | 131 | 957 | 332 | 1,124 | c'unt | 2,775 | 2,161 | 4,936 | 1,456 | 6,392 | 43 | 34 | 77 | 23 | 93 | 72 | 165 | 48 | 213 | 30 |
| Div. 3 | 2,272 | 1,769 | 177 | 1,243 | 520 | 2,353 | ed | 2,449 | 3,012 | 5,461 | 2,873 | 8,334 | 29 | 36 | 65 | 35 | 54 | 67 | 121 | 64 | 185 | 45 |
| Div. 4 | 5,194 | 4,234 | 285 | 2,117 | 1,875 | 6,190 | in | 5,479 | 6,351 | 11,830 | 8,065 | 19,895 | 28 | 32 | 60 | 40 | 71 | 83 | 154 | 104 | 258 | 77 |
| Div. 5 | 4,182 | 3,630 | 142 | 1,304 | 979 | 3,374 | 1909 | 4,324 | 4,934 | 9,258 | 4,353 | 13,611 | 32 | 36 | 68 | 32 | 70 | 80 | 150 | 70 | 220 | 62 |
| Totals | 15,546 | 11,567 | 910 | 6,400 | 3,995 | 14,514 | | 16,456 | 17,967 | 34,423 | 18,509 | 52,932 | †31 | 34 | 65 | 35 | 69 | 75 | 144 | 77 | 221 | 240 |

### October—1912—6 Days—7 A.M. to 9 P.M.

| | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Div. 1 | 1,633 | 1,413 | 270 | 1,126 | 997 | 4,813 | 307 | 1,903 | 2,541 | 4,444 | 6,117 | 10,561 | 18 | 24 | 42 | 58 | 50 | 67 | 117 | 161 | 278 | 38 |
| Div. 2 | 878 | 404 | 95 | 788 | 322 | 1,201 | 58 | 973 | 1,190 | 2,163 | 1,581 | 3,744 | 26 | 32 | 58 | 42 | 65 | 79 | 144 | 106 | 250 | 15 |
| Div. 3 | 2,641 | 2,854 | 140 | 1,529 | 2,350 | 10,298 | 954 | 2,781 | 4,383 | 7,164 | 13,602 | 20,766 | 13 | 31 | 34 | 66 | 50 | 78 | 128 | 243 | 371 | 56 |
| Div. 4 | 2,802 | 2,967 | 93 | 1,087 | 1,414 | 5,973 | 517 | 2,895 | 4,054 | 6,949 | 7,904 | 14,853 | 20 | 27 | 47 | 53 | 59 | 83 | 142 | 161 | 303 | 49 |
| Totals | 7,954 | 7,638 | 598 | 4,530 | 5,083 | 22,285 | 1,836 | 8,552 | 12,168 | 20,720 | 29,204 | 49,924 | †17 | 24 | 41 | 59 | 54 | 77 | 131 | 185 | 361 | 158 |

†Average percentages.




Map of the state of Massachusetts, showing the divisions of main roads over which the traffic census was taken

were forty-nine stations on this division. One night in each month was gven over a!so to a census, but only three stations were established in August and five in October. The Metropolitan Park had eight stations and the Boston Park system three.

With all these arrangements it was possible to get some figures that throw some light on matters that are at variance with the statements made to legislative committees relative to what motor traffic does to the road. For example, Mayor Fitzgerald, of Boston, recently said that horse-drawn vehicles were driven off the Boston parks by the motor cars, and yet this census shows that one in every six in August and one in every four in October using the parks were horse-drawn vehicles. Other statements will be taken up later, particularly as to trucks. Going back to August, 1909, there were 64,900 vehicles of all kinds registered by the watchers on the roads, and of this number 27,309 were motor cars. Compared to the 37,591 horse-drawn vehicles the percentage was in favor of the latter, the figures standing 58 to 42. This was a very close division.

When it is considered that in August, 1912, with 155 stations registering instead of 237, 60;200 vehicles of all kinds were tabulated, of which 40,391 were motor cars and but 19,809 were horse-drawn, it gives food for study. That changed the percentage to automobiles 67, horse-drawn 33. Of course, there was a large increase in the number of motor cars registered, and also in the number of tourists. But the figures seem to indicate the fact that motor cars make long trips, and so during the day the same car would be recorded several times while on the route. Moreover, as the number of stations were diminished, and the distance increased, many horse-drawn vehicles on the road turned off before coming to a station. Therefore the percentage would not be so high for motor cars had the number of stations been as large as in 1909, although it would have still changed in favor of the motor vehicles.

## 26,284 Horses on the Road in August, 1909

Giving consideration now to the traffic from a truck standpoint for a digression, in considering August of both years, one finds that in 1909 there were 17,969 heavy teams drawn over the highways in August. Of this number 7,113 were drawn by two or more horses, while 11,958 were drawn by one horse each. That represented at least 26,284 horses who were pounding their way along the state highways drawing steel-tired vehicles and doing their share to damage the roads. Motor trucks were not tabulated that year so a comparison may not be made for 1909 on that basis. However, in August, 1912, trucks were registered and it was found that 1,764 were on the roads. There were 19,809 horse-drawn vehicles registered that month, of which 10,489, or more than 50 per cent., were heavy vehicles. Of this number 3,725 had two or more horses and 7,278 one horse each. So that the horses on the road numbered at least 14,728 exclusive of those drawing pleasure vehicles. This is a reduction by about 40 per cent. from the 1909 figures, but consideration must be given to the great reduction in the number of stations. So the motor trucks were but 10 per cent. of the number of heavy vehicles on the road.

## Motor Trucks 3 Per Cent. in August, 1912

Just for the purpose of comparison let us assume that the horse-drawn vehicles, the heavy ones a!one, for we are now dealing with the trucks, traveled but 10 miles a day while the motor-driven vehicles went 50, it means that the horse-drawn vehicles averaged 104,890 miles, while the motor vehicles averaged 87,200 miles. Therefore it is reasonable to assume that the horse-drawn vehicles traveling over roads on hot days when the sun was burning up the roads did something to add to the damage that so many are always trying to blame on the motor cars. And it should be particularly noted that the motor trucks were but about 3 per cent. of the total traffic in August, 1912, while the heavy horse-drawn traffic was 28 per cent.

Turning now to the month supposed to represent the ordinary traffic conditions it is found that in October, 1909, there were 52,932 vehicles tabulated. That was nearly 12,000, or 7 per cent., less than August of that same year. Of this number there were 34,423 horse-drawn and 18,509 motor vehic!es. The decrease showed more in motor cars, where there were 8,800 less than in August, while there were 3,168 less horse-drawn vehicles, which brought the motor cars down to 35 per cent. from 42, and ran the horse-drawn up to 65 per cent. from 58. Then comes October, 1912, furnishing another basis for comparison. With eighty-two less stations than in 1909 there were 49,924 vehicles registered, a difference of 3,008 less between the two Octobers. Of this number 29,204 were motor vehicles and 20,720 horse-

drawn, the percentages being 59 and 41 respectively, or 18 per cent. more automobiles. As this is a supposedly normal month it makes an interesting table for it shows that people were turning to motor cars, perhaps, as there was a gain in the figures for power vehicles of 10,695, while the horse-drawn vehicles decreased 13,703, when compared to October, 1909.

The truck and heavy horse-drawn vehicles form another further interesting comparison. In October, 1909, no trucks were tabulated. Last year there were 1,836 trucks noted on the highways. This was but an increase of 72 over August, an indication that the motor truck business was growing a little. In October, 1909, there were 34,423 horse-drawn vehicles tabulated, of which 17,967, or more than 50 per cent., were heavy vehicles, 7,310 having two horses each, 11,567 one horse. In the same month last year, while the totals were smaller, the percentage of heavy traffic by horse-drawn vehicles had increased, for of the 20,720 noted 12,168, or about 60 per cent., were the heavy sort. And this number was about 24 per cent. of the entire traffic. Again of the heavy vehicles 5,128, or about 40 per cent., had two or more horses and 7,638 one horse each. This made at least 17,894 horses on the roads in October, 1912, hauling heavy loads. It does not include the horses drawing lighter vehicles, of which there were nearly 8,000 more.

### Trucks Gain 72 Over August Figures

Now, as August is claimed to be an extraordinary month and October an ordinary one in traffic here again is an interesting basis of calculation. In August, 1912, there were 60,200 vehicles of all kinds recorded, while in October that same year but 49,924 were tabulated, a drop of 10,276. Motor cars dropped from 40,391 to 29,204, a loss of 11,187. But the horse-drawn vehicles in October, the ordinary month, increased to 20,720 over the 19,809 in August, the extraordinary month, a gain of 611, and of these figures the gain in heavier horse-drawn vehicles was the larger, for while in August last year 10,489 were registered, yet in October the figures went up to 12,168, or 1,679 more. In other words, of the gain in horse-drawn vehicles more than 1,000, or about 60 per cent., were the heavy vehicles. And it must be remembered that the trucks gained seventy-two in October over August. Figuring again on the basis of mileage that the trucks might average 50 miles and the horse-drawn vehicle but 10, it would mean that the motor-propelled vehicles covered 91,800 miles to the 121,680 miles of the heavy laden horse-drawn vehicles.

Moreover, it is well worthy of note that the number of motor trucks increased by seventy-two between August and October, 1912, especially as August is reckoned an extraordinary traffic month while October is an ordinary month from this viewpoint.

The figures for the parks are confined more to pleasure vehicles so that heavy traffic cannot be estimated so well, but they show a large gain on the part of the trucks and omnibuses in October over August last year. The motor cars dropped in the fall month due no doubt to the fact that there were less visitors in Boston going through the park systems.

### Touring Cars Are Most Numerous

Another interesting feature to note is the division between the motor cars. In 1909 in August 5,922 were runabouts, while 21,387 were touring cars, or about three and one-half times as many of the larger cars as the smaller ones. In August last year the figures were, runabout 6,555, touring cars 32,072, showing that the percentage was growing, so that there were nearly five times as many big cars as little ones—basing touring cars as big ones for comparison—than in the same month three years before. And this with a smaller number of stations. In October, 1909, there were 3,995 runabouts and 14,514 touring cars, so that the percentage was just a little bit more than in August of that same year. In October, 1912, the figures showed 5,083 runabouts and 22,285 touring cars, so that there were more than four times as many of the larger cars, so called, that month. In other words, the runabouts kept up a pretty good percentage last year, gaining a bit over 1909.

Summing the whole matter up, therefore, from all angles legislators in all states in this country should give consideration to figures such as these before assuming to tax further the motor vehicles. In the Bay State the pleasure motor vehicles have been responsible for the state receiving approximately $1,000,000 in fees covering both the years this traffic census was taken, while there never was $1 collected from horse-drawn vehicles. And Col. Sohier, chairman of the Massachusetts Highway Commission, has stated in a speech made last fall, that there were instances where a change from horse-drawn vehicles to motor trucks has saved the wear and tear of the road. Moreover, the weather has much to do with the destruction of highways, for there is on record in one of the old reports of the Highway Commission a report of a macadam road going to pieces due to winter weather and over which a motor car had never been run. That motor cars and trucks damage roads is admitted, but whenever the opportunity arises to get extra money in any way it is the users of these vehicles that are always the target, while the owners of the horse-drawn vehicles are never even considered. So it would be well for all those interested in the future of the motor industry to make a study of the figures in this article.

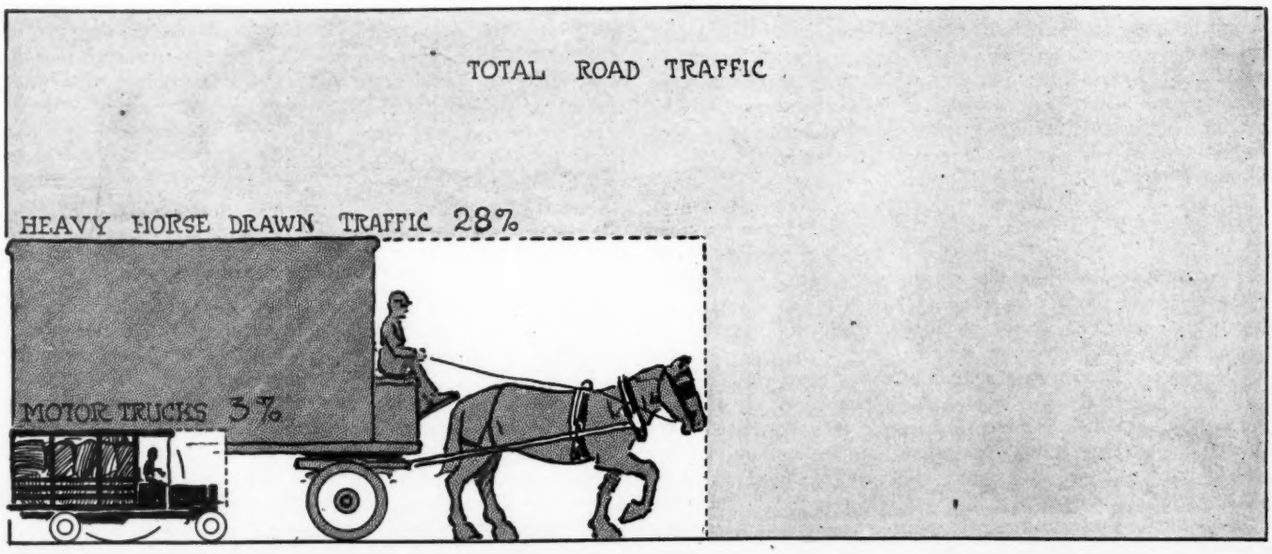



Diagram showing the relative percentages of heavy horse-drawn traffic and motor trucks on the roads of Massachusetts, from figures taken in August, 1912

# New Standard Oil Fuel

## Motor Spirit Announced To Sell at 3 Cents Cheaper Than Gasoline To Solve Fuel Problem

### New Fuel Runs From 52 to 55 Degrees Baumé—Gives More Miles Per Gallon

CHICAGO, Feb. 18—(*Special Telegram*)—With a new fuel selling at 3 cents a gallon less and with 25 per cent. more power and 25 per cent. more mileage per gallon than gasoline the Standard Oil Company comes to the rescue of the automobilist in his fight with the higher cost of motoring. Motor spirit is the name of this new fuel announced today by the company. It resembles gasoline very closely except that it is yellow in color and has a very pungent odor. It has a slightly greater range of boiling points than has gasoline, its minimum point being somewhat lower than that of the older fuel and its maximum slighter. This allows a motor to be started as easily or more easily with this fuel than with gasoline. In gravity it is somewhat heavier than gasoline, ranging from 52 to 55 degrees Baumé while gasoline ordinarily runs from 58 to 60 degrees. It is not so much the lower cost of the fuel nor its greater power that means so much to the motorist. It is the fact that by its production the output of fuel for gasoline engines from a given amount of crude petroleum practically is doubled. This will tend to prevent further rises in the price of gasoline.

### New Process for Making Spirit

Motor spirit is an additional by-product of petroleum to any which has been obtained heretofore, that is, in addition to the quantity of gasoline which formerly had been obtained from a given amount crude, almost the same quantity of motor spirit is obtained. This has been made possible by an invention of W. M. Burton and patents for the process have been granted only since the first of the year.

It is stated that the yellow color and the offensive odor could be done away with by a process of deodorizing and decoloring similar to that employed with gasoline, but such refinement would make the product just as expensive as the older fuel. The use of motor spirit requires a slight adjustment of the carbureter as it requires more air for combustion than does gasoline. Although the new fuel has the very desirable advantages of lower cost and increasing economy in miles per gallon, it has in its present state several disadvantages which may militate against its widespread adoption, particularly for use in pleasure cars. In fact the Standard Oil Company is not offering motor spirit as a pleasure car fuel but only as a fuel for motor trucks and for stationary engines.

One of the chief disadvantages, particularly where cars are to be driven on the boulevard, is that the exhaust is in the form of a white smoke, quite similar to that due to an excess of oil.

It is stated, however, that by reducing the quantity of oil smoking is to a great account overcome in fact, it is found that quite a little less cylinder oil may be used safely with motor spirit than it would be safe to use with gasoline. There is a slight carbonizing of the cylinders similar to that found when an excess of oil is used but this deposit is soft and a weekly application of kerosene has been found to keep the cylinders clean. The fuel although giving initial explosions on starting and letting the motor run for several minutes will seem to choke up occasionally until the manifold gets warm. This is due to the condensation in the manifold which seems to be much more pronounced than when gasoline is used. With the short intakes, however, this difficulty could be avoided. The odor of motor spirit, though unnoticeable in open air or in small quantities, becomes somewhat pronounced when a tank full of the fuel is kept in a closed room. For motor truck work where there is little objection to smoking and where the odor is not a fault, motor spirit will have its greatest field. The great consumption of gasoline by commercial vehicles has been threatening the available supply for some times and has been advanced as a chief reason for the increase in price of gasoline. The new fuel, however, should do very much to relieve this situation. Motor spirit has been under test by the Standard Oil Company in its own pleasure cars and trucks for several weeks and has proven its superiority of efficiency.

## Automobile Securities Quotation

This week's automobile stock market witnessed an almost general decline, the reason being the strike now pending in Akron and by which several of the largest tire manufacturers are seriously affected. Following are the losses of some of the principal issues, comparing Wednesday's quotations with those of 1 week ago: Goodyear common, 160; Firestone common, 130; Miller, 35; Swinehart, 24; Goodrich common, 15; Goodrich preferred, 11; Consolidated common, 3, and preferred, 26. The fact, however, that Firestone preferred remained unchanged and Goodyear preferred fell but 5 points, seems to indicate that the situation is hopeful of an early settlement. Among other changes are the declines of Garford, 6; Chalmers, 5; General Motors common, 4; Studebaker common, 4 1-2; White and Overland, 2 points each. International Motor preferred rose 40 points.

| | 1912 Bid | 1912 Asked | 1913 Bid | 1913 Asked |
|---|---|---|---|---|
| Ajax-Grieb Rubber Co., com | .. | .. | 165 | 180 |
| Ajax-Grieb Rubber Co., pfd | .. | .. | 95 | 100 |
| Aluminum Castings, pfd | .. | .. | 99 | 100 |
| American Locomotive Co., com | 32 | 32½ | 36 | 37 |
| American Locomotive Co., pfd | 104 | 104½ | 104½ | 105½ |
| Chalmers Motor Company | .. | .. | 130 | 145 |
| Consolidated Rubber Tire Co., com | 10 | 15 | 20 | 23 |
| Consolidated Rubber Tire Co., pfd | 25 | 35 | 80 | 87 |
| Firestone Tire & Rubber Co., com | 200 | 205 | 225 | 240 |
| Firestone Tire & Rubber Co., pfd | 108 | 110 | 105 | 107 |
| Garford Company, preferred | .. | .. | 100 | 102 |
| General Motors Company, com | 32½ | 33½ | 30 | 32½ |
| General Motors Company, pfd | 75 | 76 | 77 | 78 |
| B. F. Goodrich Company, com | .. | .. | 40 | 41½ |
| B. F. Goodrich Company, pfd | .. | .. | 92 | 94 |
| Goodyear Tire & Rubber Company, com | 330 | 335 | 300 | 325 |
| Goodyear Tire & Rubber Company, pfd | 104 | 106½ | 99 | 102 |
| Hayes Manufacturing Company | .. | .. | .. | 90 |
| International Motor Co., com | .. | .. | 5 | 15 |
| International Motor Co., pfd | .. | .. | 40 | 60 |
| Lozier Motor Company | .. | .. | .. | 32 |
| Miller Rubber Company | .. | .. | 160 | 175 |
| Packard Motor Company | 104 | 107 | 103 | 105 |
| Peerless Motor Company | .. | .. | 120 | 125 |
| Pope Manufacturing Co., com | 38 | 40 | 29 | 32 |
| Pope Manufacturing Co., pfd | 68 | 70 | 74 | 78 |
| Reo Motor Truck Company | 8 | 10 | 11½ | 12½ |
| Reo Motor Car Company | 23½ | 25 | 20½ | 21¼ |
| Rubber Goods Mfg. Co., pfd | 100 | 105 | 105 | 108 |
| Studebaker Company, com | .. | .. | 31½ | 34½ |
| Studebaker Company, pfd | .. | .. | 91 | 93 |
| Swinehart Tire Company | .. | æ | 80 | 90 |
| U. S. Motor Company, com | .. | .. | .. | 8 |
| U. S. Motor Company, 1st pfd | .. | .. | .. | 32 |
| U. S. Motor Company, 2nd pfd | .. | .. | .. | 65 |
| U. S. Rubber Co., com | 45 | 46 | 62½ | 63½ |
| U. S. Rubber Co., 1st pfd | .. | .. | 105½ | 106½ |
| White Company, preferred | .. | .. | 103 | 107 |
| Willys-Overland Company, com | .. | .. | 68 | 69½ |
| Willys-Overland Company, pfd | .. | .. | 97 | 98¾ |

## Chandler Plans Working Out

DETROIT, MICH., Feb. 17—It is learned that as long ago as last August F. C. Chandler, general manager of the Lozier Motor Company, and Samuel Regar, treasurer of the same organization, tendered their resignations and employed J. N. Whitbeck, who severed his connection with the engineering department of the Lozier company at the same time, to design the new Chandler six. C. A. Emise, sales manager, M. S. Mead, Eastern sales manager, and J. R. Hall, former manager of service, also tendered their resignations, but continued their connections with the Lozier organization until released.

It is understood that the car will not be manufactured in Detroit, although it will be built in one of the cities recognized as an automobile manufacturing center.

# Akron Plants Crippled

## Strike Calls Out 14,000 Tire Workers, As Firestone Wage Cut Gives Rise to Discontent

### Principal Plants Shut—Strikers Organize Their Campaign —Violence Expected—Stocks Collapse

AKRON, O., Feb. 19—A paralyzing blow which has sent stocks tumbling down the scale to the extent of more than 100 points in the case of two of the largest tire makers of Akron, and which threatens to spread to other centers, has occurred in the form of a strike on the part of the rubber workers.

The strike started in the plant of the Firestone Tire and Rubber Company when the wages of some of the workmen were cut from $3.50 to $3.00 a day in order to fulfill a reduced rate contract with the Ford Automobile Company. The men left the factory and waited at the gates and acted as pickets. In a short time they had recruited a formidable number and the plant was compelled to shut down. The trouble at the Firestone plant has pricked the bubble of contentment among the workers in the other local plants and as a result there is a general walkout on the hands of the other concerns. It has been necessary to close the plants of the Buckeye, Swinehart and Miller companies and the others in this city are badly crippled. The workers in the plants have already taken steps to form a union and representatives of the Industrial Workers of the World have come to Akron to take the situation in hand. It is possible that the trouble will spread to other plants throughout the United States. Local prosperity has been dealt a severe blow. The Mayor has deemed it wise to order all saloons closed and in anticipation of violence has requested troops. A wage scale committee has been appointed by the strikers as a preliminary to arbitration.

## Barley Buys Halladay Plant

STREATOR, ILL., Feb. 17—A. C. Barley has bought the property and business of the Streator Motor Car Company from the Merchants' Realization Company. While he expects to carry on the manufacturing operations on conservative lines, the business will be so operated that the old Halladay agents can be supplied with the cars they require.

Model 30 will be made and sold with electric starting and lighting equipment, listing at $1,450; a limited number of model 40 cars will also be made and sold with equally up-to-date equipment, for $1,935. Plans are also on the way for the manufacture of a few sixes, but nothing definite has been announced in this respect as yet.

## 30 Per Cent. Settlement for Thomas

BUFFALO, N. Y., Feb. 18—Edwin L. Thomas, 246 Bryant street, this city, has announced that he is willing to redeem the creditors' extension notes issued under the date of February 15, 1911, payable August 15, 1912, at 30 cents on the dollar, if these notes are sent to the office of the Commonwealth Trust Company, Buffalo. This settlement, according to Mr. Thomas, shows a possible margin of from 2 to 5 per cent. in his favor, but as the receivership will probably continue in effect for no less than another year, such a settlement will assist the present holders in obtaining their money earlier than would otherwise be possible.

## Admiral Company Officers Chosen

DETROIT, MICH., Feb. 17—At a meeting of the stockholders of the Admiral Motor Car Company, of St. Louis, Mich., the following directors were elected: Dr. A. R. Wheeler, David Harrison, J. H. Whitney, William L. Yost, Don C. Evans, G. Earl Porter and Howard Dewey, all of St. Louis. At a meeting of the directors the following officers were chosen: President, Dr. A. R. Wheeler; vice-president, J. H. Whitney; secretary and general manager, Don C. Evans; treasurer, William L. Yost. Mr. Evans, who becomes general manager for the company, for 2 years was sales manager for the Alma Manufacturing Company, at Alma. The company will build a truck.

## Market Changes of the Week

A weaker tone was developed in tin on Monday in Europe, prices here were sympathetically lower. Fluctuating throughout the week, it finally closed at a loss of $.25 per hundred pounds. Lead remained quiet but steady at $4.30 per hundred pounds. Electrolytic copper was offered at concessions here and in Europe, the closing prices on electrolytic and Lake coppers here being $.14 1-2 and $.14 7-8 respectively, sustaining losses of $.00 3-4 and $.00 5-8. There was an absence of new developments in the market for refined petroleum yesterday. Both prices on Kansas and Pennsylvania wells remaining constant at $.88 and $2.50 a barrel throughout the week. There was an absence of fresh developments of importance in the market for scrap rubber.

An easy tone pervaded the leading crude rubber markets of the world yesterday, and the reactionary tendency which developed on Monday made further progress. This applied to the markets on both sides of the water. The depression was attributed largely to the trouble which developed on Monday, causing the affairs of a leading crude rubber company to be placed in the hands of a receiver.

| Material | Wed. | Thurs. | Fri. | Sat. | Mon. | Tues. | Week's Change |
|---|---|---|---|---|---|---|---|
| Antimony, per lb.. | .08¼ | .08¼ | .08¼ | .08¼ | .08¼ | .08¼ | ..... |
| Beams & Channels, per 100 lbs..... | 1.61 | 1.61 | 1.61 | 1.61 | 1.61 | 1.61 | ..... |
| Bessemer Steel, ton .....28.50 | 28.50 | 28.50 | 28.50 | 28.50 | 28.50 | 28.50 | ..... |
| Copper Elec., lb... | .15¼ | .15⅜ | .15¼ | .15 | .14¾ | .14½ | —.00¾ |
| Copper, Lake, lb... | .15½ | .15½ | .15⅜ | .15⅛ | .15 | .14⅞ | —.00⅝ |
| Cottonseed Oil, Feb., per bbl.....6.35 | 6.31 | 6.32 | 6.33 | 633 | 6.35 | ..... | |
| Cyanide Potash, lb. | .19 | .19 | .19 | .19 | .19 | .19 | ..... |
| Fish Oil, Menhaden Brown ..... | .33 | .33 | .33 | .33 | .33 | .33 | ..... |
| Gasoline, Auto, 200 gal..... | .22¼ | .22¼ | .22¼ | .22¼ | .22¼ | .22¼ | ..... |
| Lard Oil, prime.... | .90 | .90 | .90 | .90 | .90 | .90 | ..... |
| Lead, 100 lb..... | 4.30 | 4.30 | 4.30 | 4.30 | 4.30 | 4.30 | ..... |
| Linseed Oil..... | .50 | .50 | .50 | .50 | .50 | .50 | ..... |
| Open-Hearth Steel, ton.....29.00 | 29.00 | 29.00 | 29.00 | 29.00 | 29.00 | ..... | |
| Petroleum, bbl., Kansas crude.... | .88 | .88 | .88 | .88 | .88 | .88 | ..... |
| Petroleum, bbl., Pa. crude..... | 2.50 | 2.50 | 2.50 | 2.50 | 2.50 | 2.50 | ..... |
| Rapeseed Oil, refined ..... | .68 | .68 | .68 | .68 | .68 | .68 | ..... |
| Silk, raw Italy..... | .... | 4.30 | .... | .... | 4.30 | 4.30 | ..... |
| Silk, raw Japan.... | .... | 3.75 | .... | .... | 3.75 | 3.75 | ..... |
| Sulphuric Acid, 60 Beaumé..... | .90 | .90 | .90 | .90 | .90 | .90 | ..... |
| Tin, 100 lb.....49.25 | 48.90 | 48.75 | 48.88 | 49.00 | 49.00 | —.25 | |
| Tire Scrap..... | .09⅞ | .09⅞ | .09⅞ | .09⅞ | .09⅞ | .09⅞ | ..... |

## U. S. Obligation To Be Paid

Announcement has been made, on February 14, by the reorganization committee that obligations of the sub companies of the former U. S. Motor Company will be paid after that date, at the office of the Central Trust Company, of New York, 54 Wall street, to holders of certificates of deposit which represent notes made or endorsed by Alden-Sampson Manufacturing Company, Brush Runabout Company, Columbia Motor Car Company, Dayton Motor Car Company and Maxwell-Briscoe Motor Company. The same applies to claims against the above-mentioned companies which have been admitted as valid obligations by the committee. These are to be paid in full, properly endorsed in blank, the holders being entitled to receive part cash and part voting trust certificates properly endorsed in blank, for the notation thereon of the amounts payable in both respects.

# Fisk Rubber Company Issues $3,000,000 Stock

## Par Value of Shares Is $100 Each on 7 Per Cent. Cumulative First Preferred Stock

### For the Year Ending October 31, 1912, the Company's Net Earnings Were $758,421

THE Fisk Rubber Company, of Chicopee Falls, Mass., has arranged with William Salomon & Company, New York City bankers, for the issue of $3,000,000 7 per cent. cumulative first preferred stock in shares of a par value of $100 each. The quarterly dividends are payable on February 1, May 1, August 1 and November 1, and the entire issue or part of it is redeemable by the company at 120 and accrued dividends on 60 days' notice.

The full capitalization of the company is $15,000,000, consisting of:

| | Authorized | To Be Issued |
|---|---|---|
| Cumul. first pref., 7 per cent | $5,000,000 | $3,000,000 |
| Cumul. sec'd pref., 7 per cent* | 2,000,000 | 2,000,000 |
| Common | 8,000,000 | 8,000,000 |
| | $15,000,000 | $13,000,000 |

*Convertible into common stock.

For the year ending October 31, 1912, the net earnings were $758,421. For the fiscal year ending that day of 1913, net earnings are expected to exceed $900,000, insuring net profits of fully $250,000. There is no funded debt and such cannot be incurred without the consent of three-fourths of the holders of first preferred stock, the same applying to mortgages, bonds, notes and other indebtedness maturing later than 1 year from date.

An annual sinking fund will be created for the purchase of first preferred stock; during 1914 and 1915 an amount equal to 7.5 per cent. of the entire authorized first preferred stock; after that, an amount equal to 15 per cent. of the net profits of the company will be set aside. During the past year the Chicopee Falls plant has been working at the rate of 24 hours a day, without producing more than 25 per cent. of the immediate requirements.

The Chicopee Falls company is now at the point of acquiring the property and business of the Fisk Rubber Company, of Delaware. Its own business during the past 5 years was as follows:

| Year ending October 31 | Automobile Casings | Automobile Tubes | Bicycle Tires |
|---|---|---|---|
| 1908 | 57,695 | 40,960 | 84,387 |
| 1909 | 78,259 | 59,077 | 103,085 |
| 1910 | 96,692 | 88,061 | 168,990 |
| 1911 | 125,279 | 121,584 | 207,561 |
| 1912 | 221,826 | 198,925 | 240,623 |

On the basis of an appraisal made by the American Appraisal Company, Milwaukee, Wis., the total net tangible assets, exclusive of good will, trademark and patents, aggregate $5,000,000, the net quick assets alone being in excess of the issue of prefetred stock now being arranged for.

Price, Waterhouse & Company, chartered accountants, have inspected the books of the Fisk company and report that, for the past 4 years, the net earnings available for payment of dividends were $1,337,485, averaging $334,371 per year, which exceeds the dividend requirements on the first preferred stock issue of $3,000,000 by 50 per cent. For the fiscal year ending October 31, 1912, the available net earnings aggregatd $508,421, which is 250 per cent. of the amount necessary for paying the dividend on the present issue of stock.

In case the company shall have fai'ed in respect of four quarterly periods to declare and pay the regular first preferred dividend, the holders of the second preferred and common stock shall have no voting power and the holders of the first preferred stock exclusively shall possess voting powers for all purposes, except as stated below, as long as there shall be any arrears in dividends upon the first preferred stock:

The company shall not without the vote or consent of at least three-fourths of the outstanding first preferred stock, and three-fourths of the outstanding second preferred stock and common stock;

(1) Sell or dispose in any way of the property and business of the company in their entirety.

(2) Dispose of any plant, the disposition of which would materially reduce the earning capacity of the company, unless the proceeds of such disposition shall be set aside and applied to the increase of the physical assets of the company or to the retirement of its first preferred stock.

(3) Create any mortgage or other lien to secure an issue of bonds or otherwise.

(4) Create or issue or guarantee any bonds, notes or other evidences of indebtedness maturing later than 1 year from the date of issue.

(5) Create any shares of stock having priority over or on a parity with the authorized first preferred stock or increase the authorized first preferred stock.

(6) Issue any of the authorized first preferred stock in excess of $3,000,000, except for cash at not less than par, nor unless the net earnings and income of the company before the payment of dividends on the first preferred or other stocks for the then last preceding fiscal year or the average of such net earnings and income for the preceding 3 fiscal years, whichever shall be greater, shall have been at least equal to three times the annual dividends on the first preferred stock outstanding and so to be issued. Except as above provided, the first preferred stock shall have no voting power.

## Weed Obtains Permanent Injunctions

The Parsons Non-Skid Company and Weed Chain Tire Grip Company, New York City, were granted permanent injunctions in United States District Court in the cases of the Auto Company, Mutual Taxi Company, Renault Taxi Company and F. M. Elmond. All the defendants, who were using chains infringing on the Parsons-Weed patents, consented to the action of the court, which is thus final in these specific cases.

## Injunction Against E-Z Chain

CHICAGO, Feb. 17—The United States court for the Northern district of Illinois, Eastern division, today made permanent the injunction against Edward D. Lewis, Thomas V. Garvin and Mathew J. Frambach, doing business under the name of the E-Z-On Chain Tire Protector Company and the Hartley Manufacturing Company, secured recently by the Parsons Non-Skid Company, and the Weed Chain Tire Grip Company. This is one of a half a dozen cases started by the Weed people for alleged infringement of their patents, as exemplified in the E-Z-On chain. The others made no answer.

## Ford Move for Injunction Denied

The Ford Motor Company's motion for an injunction preventing Bowring & Company, New York City, from shipping cars to New Zealand was denied in the United States Supreme Court, Special Term, Part I, New York, on February 11 by Justice Davis. The Ford Motor Company alleged that Bowring & Company, together with individuals named Vanderpool & Chavez, had formed a conspiracy for unauthorized export of Ford cars to the territory mentioned. The reason for the court's action was that the Bowring company bought the automobiles in regular course of business from the individuals.

## Wisconsin Association Meets

MILWAUKEE, WIS.—James T. Drought, of Milwaukee, the best known Wisconsin motorist in American motoring circles, was elected president of the Wisconsin State Automobile Association at the annual meeting of the directorate in Milwaukee on February 14. Other officers were elected as follows: First vice-president, Max G. Kusel, Watertown; second vice-president, Dr.

C. A. Conro, Rhinelander; secretary, H. A. Appel, Milwaukee; treasurer, George A. West, Milwaukee. Executive committee, Russell H. Jones, Kenosha; H. L. Halverson, Whitewater; George A. West, William H. Raymond and Isaac G. Hickman, Milwaukee. Mr. Raymond was also recommended to the A. A. A. as Wisconsin representative on the contest board for the present year. The fourth annual reliability tour was given in charge of the executive committee with full power to act. There is some talk of going back to grade 1 rules which governed the 1910 and 1911 tours, but were supplanted by grade 3 rules in 1912. Last year the Milwaukee dealers remained out of the tour, but the entrance of President Hickman, of the M. A. D. A. into the councils of the state association is believed to presage a return of the dealers to the contest activities of the state. Reports of officers showed that the state association now has a membership of 1,500 and a campaign will be made during this, legislative year, to double or triple the number by the employment of a state organizer.

## Columbus Buggy Creditors Confer

COLUMBUS, O., Feb. 15—At a meeting of the creditors of the Columbus Buggy Company, of Columbus, O., which went into the hands of Daniel McLarin as receiver some time ago, a committee consisting of George W. Bright, E. R. Sharp, D. N. Postlewaite, B. G. Watson, Thaddeus Dunlap and George W. Lattimer was named to draft a plan of reorganization to be submitted by mail to the creditors. A number of different plans of reorganization were discussed, but none was indorsed.

## Grossman Not Violating Injunction

Justice Holt, in the U. S. District Court, Southern District of New York, ruled on February 11 that the motion of the Rajah Auto Supply Company, claiming that the Emil Grossman Company had violated an old court injunction, be denied.

Emil Grossman Company, New York City, furnished a set of porcelains ordered by a user of Rajah spark-plugs in Connecticut. The denial of the motion was founded upon the ground that the defendant has not advertised the porcelains to be Rajah products, so that the entire matter would seem to be a blunder on the part of the clerk who sold the parts.

## Cleveland-Galion Company Fails

FINDLAY, O., Feb. 17—The Cleveland-Galion Motor Truck Company, a $1,000,000 corporation, has been placed in the hands of a receiver, Attorney A. B. Thompson, of Cleveland, being named as such court officer. The appointment was made on request of Elliott Bright, creditor to the amount of $350, and was concurred in by the company. Mr. Bright says the company is solvent, but that threats of litigation and possible filing of suits by other creditors might affect the stability of the company.

## New Underwriters' Association

CHICAGO, Feb. 15—Following along the lines laid down by Eastern insurance men, the Western Automobile Underwriters' Association was formed here last Wednesday. P. D. McGregor, of the Queen company was elected president and F. J. Sauter, secretary-treasurer. Negotiations are on for co-operation with the Eastern conference which will provide for an interlocking board of directors.

## Broadwell Resigns from Hudson

DETROIT, MICH., Feb. 14—The Hudson Motor Car Company announces the resignation of E. H. Broadwell, who has held the position of vice-president and director of sales. Mr. Broadwell's disposing of his Hudson interests is the result of a disagreement as to company policy. The directon of the sales work has been assumed by C. C. Winningham.

# New York's Fees Increase $129,481

## List of Recommended Amendments to the State Automobile Law Included in Secretary's Report

### Details of Incorporation and Automobile Bureau Work During 1912 and Comparison of Both Offices

THE report of the New York Secretary of State covering the year 1912 has just been published, containing the details of the incorporation and automobile bureau work. The following is a comparison of the work and revenue of both offices:

| | 1911 | 1911 | 1912 | 1912 | Increase |
|---|---|---|---|---|---|
| Corporation ..... | $133,989 | 8,357 Inc's | $136,663 | 8,757 Inc's | $2,674 |
| Automobile ..... | 918,197 | | 1,047,678 | | 129,481 |
| | $1,052,186 | | $1,184,342 | | $132,155 |

Compared with the receipts, the disbursements are as follows:

| | |
|---|---|
| 1911 ..... | $221,597 |
| 1912 ..... | 185,680 |
| Decrease ..... | $35,917 |

A number of amendments to the state automobile law which are being recommended in former Secretary Lazansky's report to the Legislature follow:

Requiring all persons who operate motor vehicles to be examined as to their qualifications and be licensed.

Making it a misdemeanor punishable by fine of not less than $250, or imprisonment for not more than six months, or both, for operating a motor vehicle without a license granted as above stated, and making it a misdemeanor similarly punishable for an owner to permit an unlicensed person to operate his motor vehicle.

Making it a misdemeanor, similarly punishable, for operating a motor vehicle not registered or on which there are not displayed the number plates required by the act.

Providing that in cities of the first class, no license shall be granted by the secretary of state without the approval of the commissioner of police, first obtained.

Giving the secretary of state the power to refuse any application for registration or license for cause, subject to review by the courts in a proper proceeding.

Giving the secretary of state the right to suspend a registration or license for cause and, after a hearing, the right to revoke a registration or license subject to review by the courts in a proper proceeding.

Providing that no person under the age of eighteen years shall operate a motor vehicle.

Providing that the operation of a motor vehicle by a person who is intoxicated shall be a felony punishable by imprisonment only.

Providing a uniform set of rules throughout the state regulating the speed with which a motor vehicle may be operated within limits of towns, villages and cities, etc.

Prohibiting local ordinances with reference to speed.

Empowering the secretary of state to appoint inspectors to co-operate with police authorities in the enforcement of the motor vehicl elaw.

Giving the secretary of state authority to require applicants for licenses to permit prints of their fingers to be taken.

Making effective the power of the courts to punish violators of the motor vehicle law, by specifically providing for imprisonment as well as fine.

Requiring number plates issued to manufacturers and dealers to have in addition to the regular number a serial number.

Requiring each manufacturer and dealer to notify the secretary of state within 24 hours, of the name and address of the person to whom he has sold a motor vehicle, and to whom he has, under the law, granted the temporary use of the manufacturer's number plates, giving the serial number of such plates. The failure to notify the secretary as above shall be a misdemeanor punishable by fine or imprisonment or both.

Prohibiting manufacturers and dealers from using their plates issued under the law, except for purposes of demonstration or in removing the car from place to place for purpose of sale.

Providing for a uniform flat rate fee for registration and renewals of registration of automobiles at 50 cents per each horsepower or part thereof, with a minimum fee of $5. This will be more equitable than the present fees which are $5 for automobiles of 25 horsepower or less, $10 for cars of 25 horsepower and less than 35 horsepower, $15 for 35 horsepower and less than 50, and $25 for 50 horsepower or more. It will also result in greater revenue.

Requiring the secretary of state to furnish without charge lists of owners and chauffeurs to the police in cities of the first class.

Giving to non-residents the right to operate their cars in this state provided they have been licensed to operate their cars in their own states.

Providing that the owner of every garage shall keep a record of every motor vehicle which enters or leaves the same.

In the table on page 329 of THE AUTOMOBILE for January 30 the population per car for the State of California was given as 254 whereas it should have been 25.4.

# French 2,680-Mile Run

## On March 1 Thirty-Four Cars Will Start on 14-Day Sealed-Bonnet Touring Competition

### Talbot Makes 103 Miles in 1 Hour on Brooklands—Three Peugeot Cars Will Race at Indianapolis

PARIS, Feb. 17—Agricultural motor activities promise to be an important feature in France during the present year. During the month of April the agricultural commission of the A. C. F. will hold a series of motor plowing matches and demonstrations of the use of the internal combustion motor to agriculture at Algiers, in Algeria. The rapid growth of this colony and the importance it is assuming for the supply of fruits and vegetables to the French markets make it a particularly attractive field for the motor agriculturalist.

Paris will hold its annual and national agricultural exhibition during the present month, when, in order to encourage farm workers to study the use of machinery, there will be a series of practical competitions for farm mechanics. There will be two distinct classes, one for men who are qualified to look after stationary machinery and the other for mechanics who can handle motor plows in the field. In the first class the various features on which the men will be examined will be the following: Starting an internal-combustion motor, adjusting carbureter and ignition and finding the causes of a breakdown; starting a locomobile and a thresher driven by a locomobile; fitting up a mechanical creamer; indicating the attention to be given an internal-combustion and a steam engine during and after work; showing how repairs should be carried out on various types of machinery. For men capable of handling machinery in the fields the examination will cover the following points: Fitting up a double Brabant plow; fitting up and regulating a mechanical seed sprinkler; adjusting a reaper and a reaper and binder; starting and looking after a gas motor; indicating attention to be given to a gas motor, plows and various agricultural machinery; indicting attention to be given to horses and oxen on the field and in the stable.

From March 25 to April 15 there will be another agricultural exhibition, when the Agricultural Commission of the A. C. F. wil hold a motor-plowing competition in which the sum of $2,000 wll be offered in prizes.

### Talbot Makes 103 Miles an Hour

LONDON, ENG., Feb. 18—(*Special Cable*)—On Saturday, February 15, a 25.6-horsepower Talbot car, driven by Lambert, broke the Brooklands 1-hour record by making 103 miles, 1,470 yards during that space. Lambert's car thereby beats the former world's record for 1 hour, established by Hemery, of 97 miles, 1,037 yards on a 59.6 horsepower Lorraine-Dietrich. The Talbot car used Palmer cord tires.

### Must Test on Speedway

INDIANAPOLIS, IND., Feb. 17—Local motor car manufacturers are much opposed to a bill that has passed the state Senate, forbidding motor cars to be tested on any street or highway in this county, permitting such cars to use the streets and highways only for the purpose of reaching any track used for testing purposes. The effect of the bill would be to force all manufacturers to test their cars at the Indianapolis Motor Speedway, the manufacturers say.

As the bill passed the lower house, it prohibited test cars using any street or highway in the state. The Senate amended it to include this county only. The bill will be returned to the House for action on the Senate amendments.

Having rejected a plan for a state highway commission, the House committee on roads has prepared a good roads bill. This provides for the appointment of a county road superintendent by the county commissioners in each county. The road superintendent is to direct all road repairs and construction and is to be allowed not to exceed four assistants for each 100 miles of highways under his control.

One of the features of the bill is that it requires an annual state motor car license which would range from $5 to $25, according to the size and capacity of the car. The money thus raised is to be divided among the counties, one-third equally, one-third on the basis of the number of miles of free gravel roads and the remaining third on the basis of the number of motor cars licensed from each county.

### Peugeot Cars for Indianapolis Race

INDIANAPOLIS, IND., Feb. 17—The management of the Indianapolis Motor Speedway has been notified by wire that three Peugeot cars will be entered in the 500-mile race to be held at the local speedway May 30. The word comes from A. G. Kaufmann, of New York City, American agent for the Peugeot line, who says the factory has agreed to enter the cars. Formal entries are expected in a few days. According to the dispatch, the drivers will be Georges Boillot, Goux and Zuccarelli, all of whom are foreign drivers of note. Boillot won the last European Grand Prix. Details of the Peugeot cars to be entered have not been received, although it is understood that they will be either the same cars that participated in the French Grand Prix or machines of similar design.

### Shorter Course for Big Races

SAVANNAH, GA., Feb. 14—If the recent recommendation of the course committee of the Savannah Automobile Club is adopted by the committee of the whole the Grand Prize and Vanderbilt Cup races will be run over a 12-mile course next November. As the sub-committee is composed of three of the most influential members of the general course committee it is pretty certain their judgment will prevail.

The new plan provides for a track that is 5 miles shorter than the one over which the last two big races were run here, and has the additional advantage of making it unnecessary for the county to build any additional roads.

The cars will start in front of the grandstand on Waters avenue as heretofore. and will run out to the Montgomery Cross Road; then out on the Montgomery Cross Road to Sandfly; from Sandfly to Norwood avenue; then to LaRoche avenue; then to the Skidaway road; over the Skidaway road to Dale avenue; then down the home stretch back to the starting point on Waters avenue.

### Columbus May Not Have Show

COLUMBUS, O., Feb. 14—After having made arrangements in every way for holding the Columbus Automobile Show in the Billy Sunday tabernacle, March 8 to 15, a split occurred between the Columbus Automobile Show and the Columbus Auto Trades Association which resulted in the former organization withdrawing from the show committee. This leaves the matter up to the Columbus Auto Trades Association and it is extremely doubtful if the show will be given at all this year though hope is still expressed by some. Some of the dealers favor the show while others are indifferent.

The cost of gettng the tabernacle ready for the show was in excess of $10,000 and the question of guaranteeing this expense was the cause of the split. It was believed that the Columbus Automobile Club should not guarantee the expense without the chance of some profit, which was denied it. It may be that a show will be given later.

# 175,000 at Chicago Show

## One-Sixth More Visitors Than in 1912 and 800 More Dealers Illustrate Success of the Show

### Shows in Minneapolis, Hartford, New Orleans, Washington and Newark Gratifying

CHICAGO, Feb. 17—With the closing of the doors of the Coliseum last Saturday night ended what was probably the most successful automobile show which the Windy City ever had the opportunity to witness. The 175,000 people that passed through the doors during the 2 weeks of the show were different from the visitors in other years in that a greater percentage of them came on business and fewer came to view the displays and decorations as a spectacle. As a result of this there was more real business done at the exhibition just closed than at preceding ones.

Samuel A. Miles, manager of the show, estimates that the attendance as based on the paid admissions showed an increase of more than 15 per cent. over last year's figures. One of the gratifying features was the increase in the number of dealers in attendance. The registration shows that there were 3,800 dealers in attendance, 800 more than last year. That the delegations of dealers were cosmopolitan in character is evidenced by the fact that they came from as widely separated points as Berlin, Germany, and Sydney, New South Wales.

Commercial vehicles held the floor during the second week of the exhibition, and the reports from the exhibitors indicate that the business done was far greater than that of previous exhibitions.

### Minneapolis Has Business Show

MINNEAPOLIS, MINN., Feb. 14—From an educational and sales viewpoint the sixth annual automobile show of the Minneapolis Automobile Trade Association, Feb. 8-15, in the Armory annex, and the first national show, is declared a success. A great many dealers sold a good many cars at retail and on contract, and several sold no cars, but every dealer expressed the opinion that the show was a success, considering the educational results as the most desirable feature. At the show there were 118 exhibits, 175 pleasure cars, twenty-five commercial vehicles, fifty chassis, twenty-five commercial vehicles and thirty-five accessory exhibits. Sales are estimated at $1,250,000. The attendance was nearly 200,000.

HARTFORD, CONN., Feb. 15—The sixth annual show of the Hartford Automobile Dealers' Association, held at the First Regiment Armory under the auspices of the city battalion of the state militia, which concluded this evening, was a success.

### Several Shows in Wisconsin

MILWAUKEE, WIS., Feb. 14—Two important local motor shows are being held in Wisconsin this week, and a third is scheduled for next week. At Madison, the state capital, eighteen dealers are exhibiting cars at the third annual show in the city market building, the dates being February 18 and 19. It is essentially a retail show and while many sub-agencies are placed at this tme, the principal business of the show is to make sales to the consumer direct.

Oshkosh's third annual show is being held in the National Guard Armory and will run 4 days, instead of 3. The Oshkosh show draws from the entire Fox river valley and is a retail sellers' affair, much like the Madison show. It has an attendance of approximately 6,500 during its run.

Eau Claire, the center of the northwestern part of the state, will give its show in Fournier's Academy from February 2 5to 28. Forty cars will be exhibited and an attendance of 6,000 is expected.

NEW ORLEANS, LA., Feb. 19—There are 108 cars on the floor of the Washington Artillery Hall. One of the features of the show is the increase in number and prominence of the commercial vehicles. As there has been considerable trouble with springs on trucks forced to use the cobble-stone streets of the harbor districts especial attention is being given extra heavy springs, several designs of which are on exhibition. Shock-absorbers of various makes are being urged by the commercial car men as well as those selling pleasure vehicles. Floor space in the main show was so limited that a number of overflow exhibits have been arranged. Several trucks are being demonstrated in the streets adjacent to the show, while an engine and numerous accessories are being displayed in hotels and business houses.

### Denver Show Opens March 4

DENVER, COL., Feb. 17—The dates for the twelfth annual automobile show at this city have been fixed as March 4 to 8. The show will be held in the Auditorium, which will be elaborately decorated. Red and white have been decided upon as the official colors for the exhibition. The regular lighting equipment of the Auditorium will be supplemented by a large number of powerful electric globe-lights, one to be hung at the top of each of the white columns to be installed.

### Many Sales at Washington

WASHINGTON, D. C., Feb. 15—Washington motor car dealers are elated over the success that marked the first motor car carnival or opening week, which came to an end tonight. Sixteen dealers, representing many of the most popular makes of cars on the market, participated in the affair, and the sales made during the week more than justified the expense entailed by the dealers. The carnival week was inaugurated with a motor car parade in which nearly 500 machines took part, a record-breaking crowd being out to witness the parade, which was over the principal streets of the city.

### Newark Show Success

The sixth annual automobile show held in Newark, N. J., opened on the night of February 15. More than 300 pleasure cars and commercial vehicles were on exhibition, representing forty-eight pleasure car firms and twenty-one commercial firms. In point of attendance the show has proved a decided success. As a special feature the show committee has obtained the National racing car which made such an enviable record last year and also the trophies won by the Marmon company.

### St. Louis Show Two Weeks

ST. LOUIS, MO., Feb. 15—The eighth annual St. Louis Spring Automobile Show will be much larger than was at first anticipated. It has been decided to make it a two week's show. The first week will be for pleasure cars and accessories, while the second week will be devoted to a display of commercial. The show will open on February 24 and continue until March 8.

SAN FRANCISCO, CAL., Feb. 15—San Francisco will see its first annual truck show this year, which will open in the Coliseum Hall April 1 and will keep open until April 16.

# Digest of the Leading Foreign Journals

## Constructive Improvement to Simplify Automobile Fire Engines Takes Another Forward Step in Germany—Body Builder Gives Strict Rules for Caretaking Showing Ultimate Unfitness of Paint and Varnish for Motor Cars

**New Type of Centrifugal Fire Pump.**—While America still stands doubtful towards the mobile and relatively inexpensive fire engine which is essentially an automobile with a high-speed pump actuated from the automobile motor, and permits the fire departments to place large orders for equipments of the old and accustomed types, Germany and, more recently, France are going ahead developing and improving the simpler machines in which it is always the same engine power which serves transportation and fire service purposes, and the designers in these countries have succeeded in removing most of the shortcomings which in the United States are still mentionel as decisive against the new type. While both Germany and France are divided with regard to the relative merits of centrifugal pumps, pumps with rotary pistons and pumps with high-speed reciprocating pistons, they have managed to develop each of these varieties to such a point that those fire departments which are friendly to the new movement no longer insist that the new apparatus shall be dimensioned and powered with a view to fitting into the older conditions, or to working in unison with steam pumps or chemical engines, but accept the idea that the fire-fighting tactics should be modified to agree with the capacity and range of the best new engines in which respect there are always some compromises to be made, however, since the construction is in a state of constant development.

It is at the same time emphasized by one of the leading authorities on automobile construction in Germany (Privy-Counselor Riedler) that the advancing development of the centrifugal pump for fire engines holds out the best promise so far mechanically realized for the eventual perfecting of a simplified hydraulic transmission for automobiles and commercial motor vehicles.

The weakest point in the fire engine with centrifugal pump has so far been found in the special provisions which had to be made in order to make it act as a suction pump, so as to draw water from a lower level where no hydrant pressure is available, at the start of operations. If the supply hose leaked or joints were not screwed up tight, dependence had to be placed in these provisions not only at the start but also after every intermission in the play of a stream. The continued operation of the pump was not in itself sufficient to prevent the column of water in the supply hose from breaking, under these conditions, if the flow of water from the hose nozzle was not kept up. The provisions adopted to offset this limitation of the centrifugal pump consisted usually in switching into the water circuit a small positive pump, capable of acting on air as well as on water, or in equipping the vehicle with an auxiliary water tank holding 75 to 100 gallons of water from which the supply pipe could be filled at the start and after interruptions. Altogether the troubles experienced at this point have accounted for the preference shown for rotary piston pumps in Berlin and some other German towns and for reciprocating piston pumps in France, despite the greater complication of mechanism and gears which is necessary with these types (see THE AUTOMOBILE of Jan. 30, page 351) but, on the other hand, the great simplicity of the centrifugal pump and the wide range of fire conditions which it can meet by mere throttle control, so far as the reach and volume of the stream thrown by it are concerned, have acted as a powerful stimulus among designers of this class of pumps for improving it from all points of view and especially ridding it of the one important drawback referred to. The latest improvement of this nature is described by Engineer Schwerdtfeger with reference to the illustrations reproduced in Figs. 2 and 3. The general contours of the fire engine, made at the Adler works at Frankfurt am Main, to which it is applied, are shown in Fig. 1. Instead of having side seats and a hose reel it can also be equipped as a touring car, giving additional comfort for long runs, and is in that case scarcely distinguishable from a large automobile, excepting that the pipe joints, the larger one for coupling the suction or supply hose and the smaller one for the pressure hose, are visible at either side at the middle of the vehicle, and that the vehicle in service carries the suction hose on the running-boards while the pressure hose is stowed in the rear of the carriage body.

The construction of the chassis is interesting at many points, but the one feature which craves attention outside of Germany is the improved centrifugal pump, because it is capable of operating on air and therefore can draw water from a lower level, thus representing an advance step in the very principle of centrifugal pumps. To be sure, a water tank is employed for this purpose but it contains only 9 gallons. It is located back of the dashboard, in front of the driver who can connect and disconnect it, with relation to the pump, by means of a small hand-wheel. No check valve at the lower end of the suction hose is required in order to make the suction effective. The construction therefore has the full advantage of the centrifugal system in being able to handle water in which there is sand or mud. It is also shorter than the ordinary high-pressure centrifugal pump with four speed translations.

### PRESSURE RAISED FOUR TIMES BY TWO WHEELS

In Fig. 2 the Roman figures II to X indicate the course of the water in the conduits of the pump, here shown in longitudinal section. It flows in through one of the two suction pipes—the one not used being plugged—and reaches the introductory channel L. This channel does not take it to the entire area of the central entrance to the first centrifugating disk A but only to the upper half of this area. Here its speed is increased and it enters the channel II and is bypassed through III back to the lower half of the centrifugating disk A where the speed and pressure are again raised. Passing from IV to V and from V through VI to the lower entrance to the second centrifugating disk B and thence through VII to VIII to the upper half of the same wheel and out through channel IX into the pressure channel X, the water again reaches higher speed and pressure twice; so that, in all, four advancements of the pressure are accomplished by means of two centrifugating disks.

As the water enters the centrifugating chambers from opposite sides, end-thrust of the pump shaft is avoided by this construction, which means a considerable simplification in the mechanism of the bearings.

The suction and pressure pipes are located so high with relation to the pump body that the water does not run out of the

latter when the supply hose or pressure hose is uncoupled. The pump body thus remains almost full of water after an interruption of service and is also connected with the small water tank previously mentioned by two pipes, one opening into the suction chamber of the pump and the other into the pressure chamber X. When the engine is in normal operation both these conduits are closed. At the start—provided no hydrant pressure is available—they are both opened, and when the tank is to be refilled only the conduit leading to the pressure channel is open. The operation under this most trying condition is as follows:

AIR EVACUATED BY CENTRIFUGAL PUMP WITH WATER JOINTS

In order to start, the suction hose is attached and connected with the water supply, while the slide valves of the suction pipe as well as the slide valves or the different pressure hose couplings remain closed. The pump is completely filled with water from the tank, and the pump is then clutched to the motor shaft. (In the Adler construction the shaft from the vehicle clutch to the gear box runs through the hollow pump shaft.) A circulation of water between the tank and the pump is now effected, and the water from the tank runs into the suction chamber of the pump through the pipe shown in Fig. 3 above the letter Z which represents a specially shaped trough causing the water to fall in two cascades into the introductory channel (L in Fig. 2), and the latter is divided into three compartments by means of two ribs FF. The water falls mainly into the two outer chambers, while the central one contains mainly air. Now the slide valve to the suction hose is opened a little and air is drawn out of it, the water making the pump act efficiently as an air evacuater, and the mixture of air and water is passed through the pump to the water tank where the air separates from the water and passes into the atmosphere through an overflow pipe. Meanwhile the water from the low-level supply has replaced the air taken from the suction hose, the slide valve for the latter has been opened completely and the condition for normal operation has been established. The conduit from the water tank to the suction chamber is now first closed, whereby the tank is refilled until it begins to overflow, and then both the conduits from the tank are closed.

Trials with this construction have shown that water can be raised 9 meters in less than one minute and without failure, and that in the subsequent normal operation the pump continues to raise the water this height while at the same time developing a pressure of 8 atmospheres, corresponding to the work of raising the water, inside of the hose, to a height of 80 meters.

With four hose simultaneously at work, each with an interior hose diameter of 52 millimeters (a little more than 2 inches) and a nozzle diameter of 10 millimeters, streams were thrown to a height of 30 meters and the delivery amounted to 800 liters (211 gallons) per minute. The motor in the machine develops 40 horsepower at 1,500 revolutions per minute.—From a more complete description by Schwerdtfeger in *Der Motorwagen*, January 20.

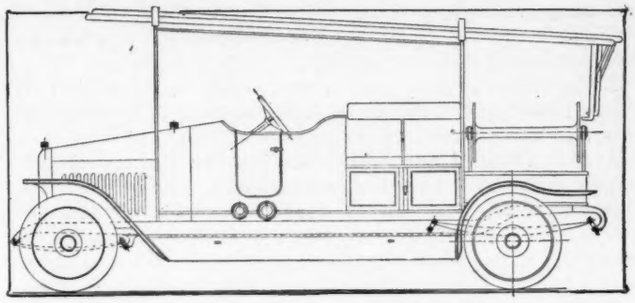


Fig. 1—General view of Adler fire engine with Gentil pump

**DIRECTIONS for Grooming an Automobile**—A double interest attaches to the directions given by Georges Kellner, of the well-known carriage-building firm of Kellner & Sons in Paris, with regard to the care to be given the bodies of automobiles. In the first place they proceed from the best knowledge on the subject and may be applied directly by any owner of automobiles in his relation to his chauffeur, caretaker or stableman, and, secondly, their very exacting nature suggests the urgent need of devising materials and a finish for automobile bodies which may be kept in presentable order with much less of care and labor than is now involved in the task. The directions are given in full in the following:

The care of the carriage work is a very important question to the owner of a vehicle. Every owner who is economical and careful of the elegance of his conveyance should always before entering his automobile throw a rapid glance over it to see that everything is proper and correct.

He should also occasionally assist at the washing of it. A conscientious mechanic can only be flattered to see that his principal is interested in his work.

The durability of a carriage body depends upon the quality of its manufacture, the maintenance of it and upon its paint. A vehicle should therefore always be well covered with its paint and its varnish. At this point the proverb that a stitch in time saves nine may be seriously applied. To wait till the paint becomes rough or the wood exposed before having the work done over is from no point of view advisable. It is necessary to groom this coat of paint and varnish with extraordinary care and not to forget that this care must be so much more assiduous the more the vehicle is exposed to wear and tear.

Water is the enemy of carriage work and the greatest cause of its deterioration. It rots it when it is in the wood; it rusts and disintegrates the sheet metal. A carriage body into which water enters by slow degrees is doomed to early decay.

Consequently, washing with a hose should be completely prohibited. Water used in too great abundance and at too high pressure deteriorates the paint at the joints, works in between the moldings and the panels, penetrates to the door drops and to

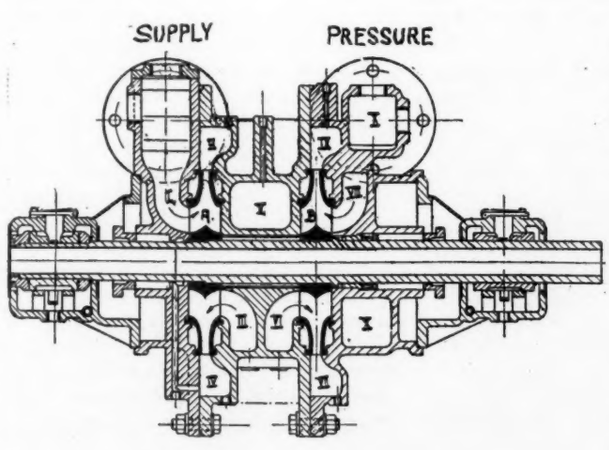



Fig. 2—Longitudinal section of Gentil centrifugal fire engine pump. The course of the water is indicated in the succession of Roman figures from II to X

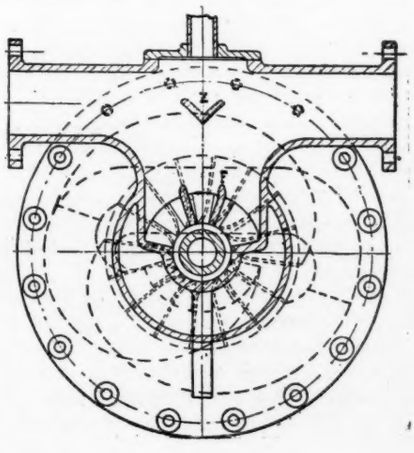


Fig. 3—Transverse section through supply pipes and introductory chamber of Gentil pump

the linings, remains in corners where it cannot readily be wiped off, and can in the long run loosen the glued joints, make the wood swell and the paint fall off.

If the hose is tolerated, as it unfortunately is, it should at all events absolutely be provided with a rose so as to break up the power of its stream.

At the Kellner establishments the hose is tabooed. At the largest garage in Paris it has been abolished.

In one word, water should be used freely in washing the carriage but not in excess. To this end, washing with a pail of water and a sponge is a hundred times preferable to washing with a hose.

On the other hand, it is of the highest importance that a vehicle is well wiped after the washing, so that no water will stay long at any one point or streak the varnish.

The varnish should be particularly well treated, so as to remain brilliant for a long time and thereby fulfil its mission as a protector.

All dirt should therefore be removed at once upon the return of the vehicle to the stable before it has had time to dry. Unless this is done, the dirt leaves spots (especially on freshly painted vehicles) which detract notably from the lustre of the varnish and are difficult to remove.

The dirt must not be removed by rubbing. The mop is a poor instrument, even for the wheels. By using it, one spreads the dirt which acts like sandpaper and destroys the whole brilliant and protecting surface of the varnish. The mob is a stable tool intended for assisting in cleaning the feet and legs of horses but not for brilliant surfaces. The continued use of it ends by laying the wood bare.

Other things to be prohibited are: The addition of kerosene or gasoline to the water used for cleaning and the use of soap. Both these expedients roughen the varnish in the long run. Finally, hot water is banned because it makes the varnish crack or peel off; it may also affect the glue in the woodwork.

### NECESSARY UTENSILS

Two good and large sponges; one for the carriage body and one for the chassis and wheels; two shammy skins.

The sponge and the skin intended for the running gear must not be used for the body, to avoid carrying oil and grease from one part to the other.

Two or three pails.

A large trough, to assist in filling the pails rapidly, if other means for this purpose are not at disposal.

A very soft feather duster, which must only be used for removing the dust which settles in the stable. Further, the dusting must be done very lightly with the ends of the feathers. The dust of the road must always be rinsed off with water.

A brush for the upholstering; a whisk broom for the mats or rugs.

A beater, a skin ball or soft rags.

A jack, a footstool.

Washing should be done in the shade, so that the water shall not dry too rapidly. The sunlight drying it up quickly, is likely to leave streaks or spots on the varnish.

In the winter the washing should be done in a sheltered place where the water will not freeze on the vehicle, but under no circumstances should hot water be used.

All interior and exterior cushions should be removed; also all the carpets, and these should be brushed after the washing.

All the upholstering should be beaten and brushed.

The windows of close vehicles should be raised and the tops of open ones should be removed to avoid getting water into the interior.

Begin by removing the worst of the dust and dirt. To this end, throw from a distance of a step or two, one, two or three pails of clean water against each exposure of the vehicle (the two sides, the rear and the front part of the running gear). Thereafter, fill the pails with fresh water again and return to the part at which work was begun and start by dashing water obliquely from a well-soaked sponge against the panels to loosen the dirt and make it drop off. Finish by sopping the panels lightly with the sponge. Under all circumstances, do not rub so long as the dirt has not yet been removed.

In the case of a close vehicle or one with a top, begin with the roof, washing it with a sponge full of water and wipe it dry at once. The sponge should be frequently rinsed out in the pail and the water in the latter should be changed as soon as it becomes too dirty.

When the carriage body has been washed, remove first—while always proceeding in the same order—all surplus of water by using the sponge for this purpose after squeezing it off, wet the shammy skin and wring it off and, with it, dry conscientiously the panels, the window panes and all the corners where water might linger.

Wring off the shammy skin from time to time by twisting it around the pail handle, so as to remove the water which it has absorbed.

When the body has been finished, pass to the motor hood, to the chassis and to the wheels, wiping each of these parts dry as soon as it has been washed.

When the washing is done, attend to the nickel and other plating, beat the cushions, clean the carpets and put them back in place; then rinse the sponges and the skins and empty the pails.

Two hours are required for the cleaning which has been described and which is usually done in the morning.

Every neat chauffeur should be careful not to place rags, wrenches or maps under the cushions, as this practice spoils the shape of the cushions and gives the vehicle a messy appearance which is in bad tone.

### SPECIAL REMARKS

It is difficult under certain circumstances to proceed at once to the washing of a vehicle after it has been out. An automobile may be called upon to go out several times in one day; sometimes even morning, afternoon and evening. It is impossible to wash thoroughly after each of such trips. The amount of work involved cannot be asked of one man, although a vehicle used so severely should have more care than ordinarily is required. In such cases it is necessary to have a stableman or to put the vehicle up at a garage where special men do the washing.

However, a careful chauffeur can find time to give his vehicle a superficial cleaning after each trip, even in the evening. He can throw water over it and rapidly wipe the carriage body and the top of the fenders. This will take about 45 minutes.

A vehicle which has been out in dry weather and is covered with only a very light coat of dust, can at a pinch remain in this condition if it is intended to go out once more the same day, but it must in all cases be washed after the second outing. A vehicle which has been out should never be left unwashed more than 24 hours.

### MISCELLANEOUS ADVICE

From other advice given by Mr. Kellner, most of which is familiar, a few extracts are presented:

The private garage should not be near to a horse stable, as the ammonia in horse dung causes paint and varnish to crack. A carriage should never be placed near to a stove. In storage it should be washed once in a while to keep the varnish bright, and upholstery should be brushed to keep moths out.

If leather tops harden they should be rubbed with neat's foot oil and brushed till they shine. No top should be left long folded but should be raised at every chance to obviate wrinkles and cuts. Celluloid windows are cleaned with alcohol.

Obstinate mud spots are removed by rubbing them lightly with a wad of cotton soaked in linseed oil. It is useful to have at the private garage a pot of black japanning, wherewith to touch up from time to time the lamp brackets (if they are black), metal wheel rims and the under part of steps and fenders. It should be applied only in very light coats.—From *Omnia*, January 18.

# Preventing Vibration

## Periodicity of Rocking Moment Broken by Lanchester Device Using Four Rotating Weights

### Device Is Absolutely Silent and Is Invisible—Used on Fours or Sixes

IT is a well known fact that the balance of an ordinary four-cylinder gasoline motor is not perfect. At high speeds of revolution the vibration of a four-cylinder engine becomes quite a serious factor, both as affecting the comfort of a vehicle and as prejudicial to the durability of both chassis and body work. It is in fact on this want of balance of the four-cylinder engine that the demand for the six-cylinder engine is mainly based. It is true that the six-cylinder engine for a given power has the advantage of more uniform torque, that is to say, for any given mean torque there are less extreme limits of maximum and minimum, but the advantage of the six-cylinder engine in this respect is a secondary matter as compared with its advantage in the matter of smooth running as dependent upon more perfect balance.

The main piston movements on a four-cylinder engine may be said to be balanced, since the pistons of Nos. 1 and 4 cyliders are at their highest point when Nos. 2 and 3 are at their lowest point and vice versa. If the connecting rods were of infinite length, or in practice of such a length that their extreme angularity were very small, all four pistons would reach mid-stroke position at the same instant and at all other points Nos. 1 and 4 pistons would by their motion accurately compensate for Nos. 2 and 3. In an actual engine with a rod length of about two and a quarter times the stroke, Fig. 1, there is a considerable error in the position of the pistons when they should be at mid-stroke, thus when the crank pin is at 90 degrees from the dead center all four pistons are somewhat below their mid-stroke position, in the case of an ordinary 20 or 25-horsepower engine the error of position amounts to about .25 inch. This downward displacement of all four pistons due to connecting rod angularity takes place twice per revolution, or (regarding the main piston motions as mutually balancing each other) there is left a displacement of the whole reciprocating equivalent mass through the distance of .25 inch vertically taking place twice per revolution.

Analysis shows that this displacement may be approximated to a very close degree as a harmonic motion of twice the crankshaft period and in the new anti-vibrator a simple means has been found to compensate for this source of disturbance.

The serious magnitude of this secondary vibration on existing four-cylinder engines is scarcely appreciated by many designers; it amounts on an ordinary 25-horsepower four-cylinder motor at full running speed to as much as .5 ton applied alternately upwards or downwards twice per crankshaft revolution. The importance of eliminating a want of balance of this magnitude can scarcely be overstated.

On an open car, the vibration due to the cause under discussion is always felt at certain critical speeds and has hitherto been looked upon as inseparable from the four-cylinder design. Of recent years the trouble has become aggravated owing to a powerful sympathetic vibration or resonance set up in landaulettes, limousines, and other closed forms of body such as have to-day come into general use. It has therefore become difficult in a four-cylinder car to meet the demand for perfect smoothness consequent on the public having become educated up to high ideals by the six-cylinder car.

The new anti-vibrator patented by F. W. Lanchester the well known designer acts by supplying the equivalent of a reciprocating movement equal and opposite in effect to the unbalanced component of the piston and connecting rod motion, of twice the frequency of the main piston reciprocation.

The means employed is shown in Fig. 2. It will be seen that there is no actual reciprocating part but in place thereof four rotating weights A are provided, arranged symmetrically in pairs at the extremities of spindles B1 and B2 driven by screw gears C1 and C2 at double the crankshaft speed. The two spindles rotate in opposite directions and so the lateral movements of the balance weights, that is the horizontal components of their motion neutralize one another but the vertical motions combine to give the effect of a single reciprocation. The diagram Fig. 3 explains this action. Here the corresponding position balance weights are numbered 1, 2, 3, etc., and their common center of gravity for each numbered position is given at 1′, 2′, 3′, etc.

It is possible in this arrangement to correct for irregularities of turning moment due to piston inertia, these following the same law as to frequency as the linear secondary vibration. But in the ordinary gasoline motor the advantages in this direction have not hitherto been found sufficient to give any marked superiority to engines corrected in this sense.

The balance weights in any case are quite small. In the arrangement shown in Fig. 2 each weight weighs about .5 pound for an engine of 25-horsepower.

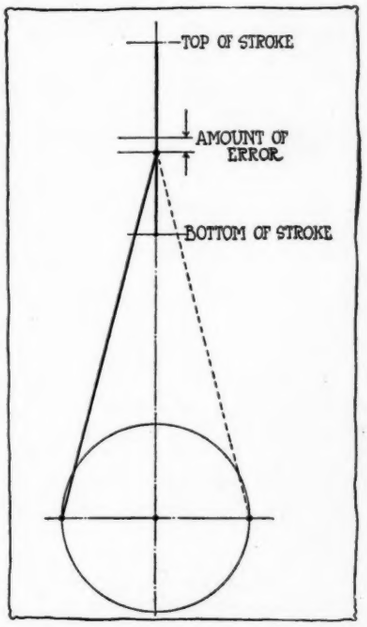



Fig. 3—Error due to angularity of connecting-rod

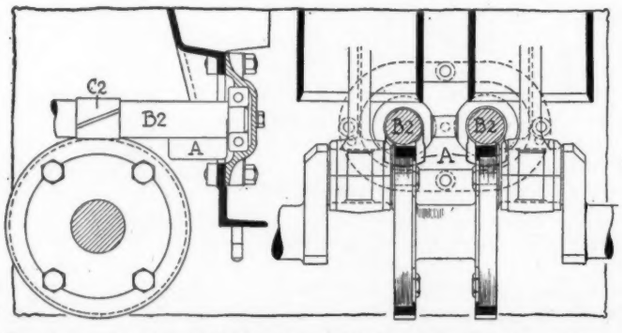



Fig. 1—Lanchester Anti-Vibrator applied to four-cylinder motor

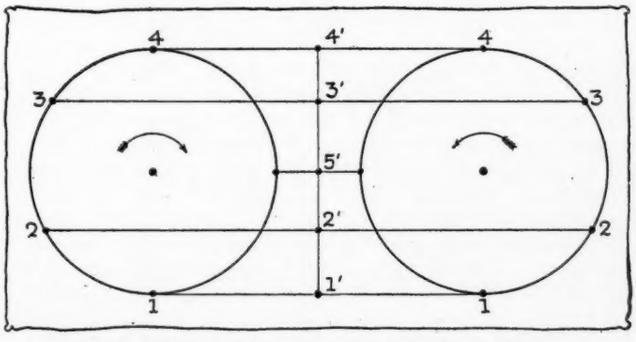



Fig. 2—Virtual motion of center of gravity of device

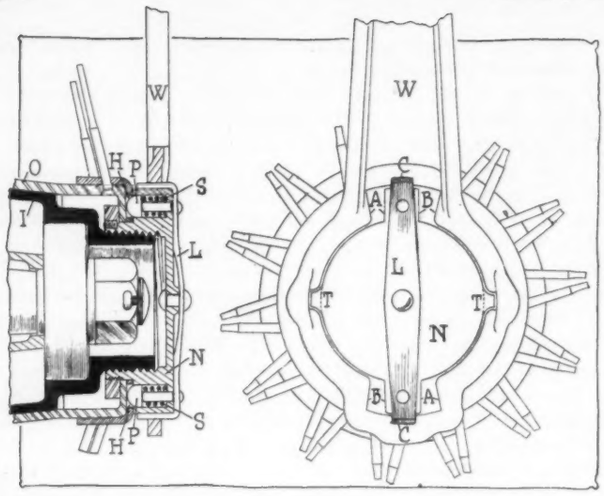



Fig. 1—Detail of locking device on McCue wire wheel

# McCue Wheels Used As Regular Equipment

## Two American Makers Fit This Make to 1913 Cars

THIS year marks the introduction, to any real extent, of the wire wheel into the automobile practice of America. This type of wheel has withstood a practical test for several years in Europe and is therefore far beyond the experimental stage.

One of the advantages possessed by the wire wheel over the wood artillery wheel is that absolute circularity of the rim, besides truth in the relation of rim to hub, is maintained irrespective of atmospheric changes. This is owing to the fact that only one material is used throughout its construction, and consequently even expansion or contraction of the components, on varying heat conditions, results.

One of the objections raised against the wire wheel two or three years ago in Europe was that moisture found its way through the junction of spokes to rim and caused damage to the rubber tire. If there was any foundation for this objection it certainly does not hold with the present-day methods of accurate spoke fitting and thorough enameling.

The McCue Company is a pioneer manufacturer of wire wheels in this country, and its product appears this year as a standard fitting on some of the important car builders.

The McCue wheel follows European practice in that it belongs to the triple spoke class. It is built on a pressed steel hub O, Fig. 2, of conical shape. The spokes, drawn from a special alloy steel, have enlarged ends to provide a strong fastening. Small semi-spherical depressions in the rim form a seating for the spoke nipples. The method by which each spoke is tightened to a uniform tension is interesting. A special wrench is used for this purpose, so designed that when the tension applied to the spoke reaches the right point, which is in the neighborhood of 1000 pounds, the wrench automatically stops tightening it any further. The wrench is set at the desired tension, and the operator simply tightens each spoke nut until the wrench refuses to make it any tighter.

After lacing up the wheel in this manner, it is trued by hand, and a final absolute truing of the hub to rim obtained by machining the interior of the hub while the wheel is held in a chuck by the rim.

Seventy spokes are used in the standard wheel, made up as follows: outer set, twenty-eight; cross, twenty-eight, and inner fourteen.

A point of considerable importance in the fitting of spokes is the angle at which each spoke enters the hub or flange to which it is fixed, i. e.: the angle between the center line of the spoke and the direction of the hole in the hub which receives it. In bicycle practice the flange is usually at right angles with the axis of the hub, and therefore it is necessary that the spoke end be bent through 90 degrees. Mechanically, this is a weak fastening. It requires that the spoke at that point be much heavier in order to equal the breaking strain of the spoke proper, than would be necessary if the spoke end passed through a hole in line with its axis.

Of equal importance is the outer end of the spoke. The screw thread which is necessary here to take the spoke nipple brings down the tensional strength of the spoke to that of a wire equal to the diameter of the base of the thread. It will be noticed that the ends of the spokes in the McCue wheel are considerably larger than the body of the spoke so as to eliminate any weakness that might follow if the points mentioned above were ignored. A further reason for this enlarging of the ends is that most of the driving strain is met at by these portions of the spokes.

Turning now to the method of mounting and locking the wheel, the inside of the wheel hub is machined to fit accurately the conical surface of inner hub I, Fig. 1 to which it is clamped by the locknut N. The drive is taken by a series of studs S positively connected to the inner hub and which project into corresponding holes in the flange of the wheel hub. The locknut is shown in detail in Fig. 1. It is of the floating type, that is, it is free to rotate on the wheel hub, but cannot be detached therefrom. This is an excellent feature of the wheel. Except for the special wrench there are thus no separate parts to lose or forget, while changing wheels. Two spring-actuated pins P are the means of locking the nut after screwing up. These engage with

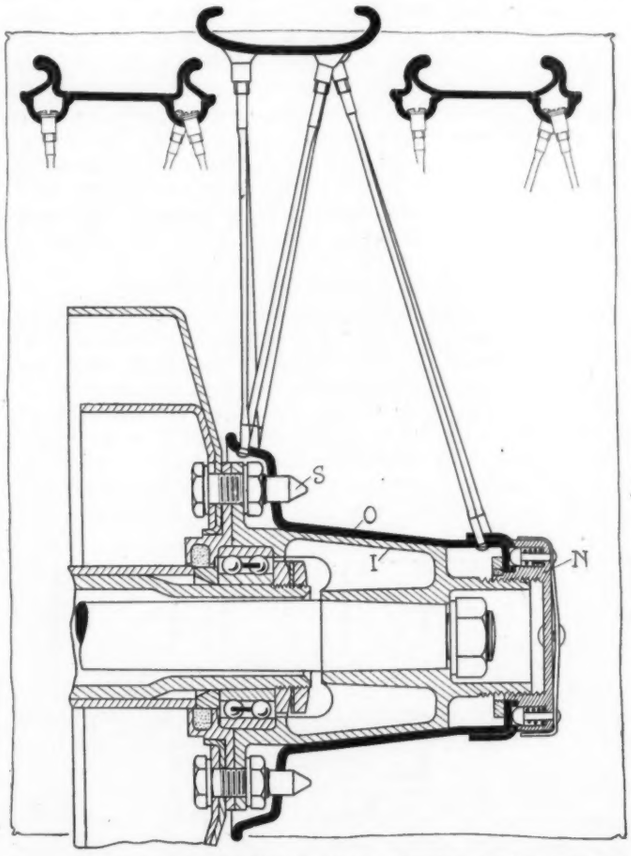



Fig. 2—Section through McCue wheel, showing conical hub and method of driving by spigots

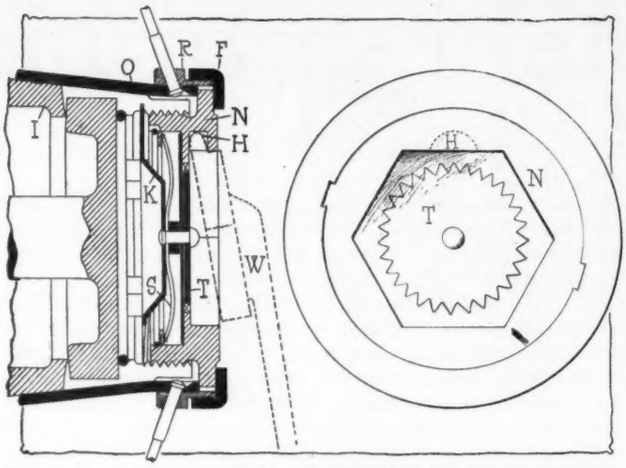



Fig. 3—Special locking device adapted to McCue wheels by Edwards Motor Company

a number of holes H drilled in a flanged ring shrunk on the end of the wheel hub. The springs S are sufficient in themselves to retain the locknut unless considerable turning force be applied, but an absolutely positive lock is insured by the use of a stiff flat spring L, which normally is in such a position as to prevent the pins P from sliding out of engagement.

The operation of removing the wheel is performed by a special wrench W which can only be placed over the nut in such a way that two small notches C engage with the ends of the cross-spring L. On applying force to the handle the spring C is first rotated through a few degrees until the faces B come into contact. This movement uncovers the ends of the pins P which are then free to move against the action of the light springs S and a further rotation of the wrench handle unscrews the nut, drawing the wheel with it by means of a flange on the inside. On replacing the wheel it is impossible to remove the wrench until it is in the position shown in the diagram, owing to the teeth T, which otherwise would be resting on the face of the wrench ring.

In Europe, where the extensible beaded tire is the rule, it has not been the custom to use detachable rims on wire wheels, but the introduction of these wheels to the American market made it necessary to incorporate the Q. D. rim owing to the prevalence of inextensible tires. The very slight addition thus made to the weight carried at the periphery is more than compensated by the greater facility with which tire changes can be made. In this connection it is rather to be wondered at that the European motorist has not demanded the Q. D. rim, even for use with extensibly beaded tires.

The insets in Fig. 4 show a type of detachable rim fitted to some of the McCue wheels. It will be noticed that the rings are reversible so as to be adaptable for either straight-sided or clincher tires.

Another type of Q. D. rim is shown in Fig. 4. This is a product of the Standard Welding Company and is incorporated in the McCue wheels used on the Edwards-Knight and Henderson cars. The method of fastening is shown in the same illustration. The split ring C is provided at its ends with notched teeth T, which project through holes in the rim proper, and are clamped thereto by the latch L. This latter carries an oval-shaped piece P, which permits the ring to be withdrawn when the latch is in the position shown in the lower illustration, but which engages the notches in the teeth when the lever is laid along the rim. No special tools are required in the operation of this locking device. The rims are made to accommodate either clincher or straight-sided tires. The latter type is shown at 4, in which it will be seen that the detachable portion is not altered in any way, being merely reversed.

A locking device which differs from the McCue standard is that shown in Fig. 3. This design has been brought out by the Edwards Motor Company and is incorporated on all the McCue wheels fitted to the Edwards-Knight cars for this year. It is characterized by a smooth and neat external appearance.

The flange on the existing wheel hub is turned off, and a ring R fitted outside through which the spokes pass at their inner fastening. A flanged ring F screwed on to the ring R provides a free seating for the locknut N, allowing it to be turned but not detached. This nut is screwed inside to engage directly with the inner hub I, a hexagonal depression on the front face being provided to take a wrench W for applying and removing the wheel. Actual locking takes place between the toothed disk T and the corresponding aperture in the locknut. A three armed spider K is the means employed to maintain the locking disk in permanent relation with the inner hub O. Rigidly attached to the toothed disk is a flat spring so arranged that the disk is normally forced outwards in engagement with the locknut, being prevented from passing right through the aperture by a guide disk fixed to the inner surface.

A hexagon headed wrench W, shown in dotted line, is the only tool necessary in the operation of applying and removing the wheel. On applying the wrench a tooth projecting from one of its faces engages with a milled hole H in the locknut, forming a fulcrum on which the wrench is swung into place. In so doing the inner surface of the wrench comes in contact with a rivet head in the center of the disk T, thereby forcing in the latter against the action of the spring S, and out of engagement with the locknut N. The locknut is then free to turn and on being rotated forces up the wheel on the inner hub I or withdraws it, by means of the flange F.

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## Overloading vs. Brake Capacity

Loading a truck above its rated capacity and driving a car at too high a speed are the same sort of misdemeanor, when one comes down to a final analysis of the problem. On the surface, it would seem that a man who owns a truck may put a load of 8 or 10 tons on it, even if the rating is only 5 or 6 tons. One might argue that the excessive depreciation which is the inevitable result of overloading, is as much as the business of the owner as insufficient lubrication or any other neglect. This, however, is not true.

A man who overloads his truck, driving it over public highways, jeopardizes public safety in exactly the same proportion as he exceeds the rated loading capacity of the truck. The reason for this is that the brakes on each vehicle are designed to absorb a certain momentum, that is to say, to nullify the dynamic energy of the moving body by changing it into friction and heat. A certain momentum, that is, the power used for driving the truck at a certain speed, may be absorbed, and no more. If the truck is driven above that certain speed, the brakes will not be able to hold and act as they should.

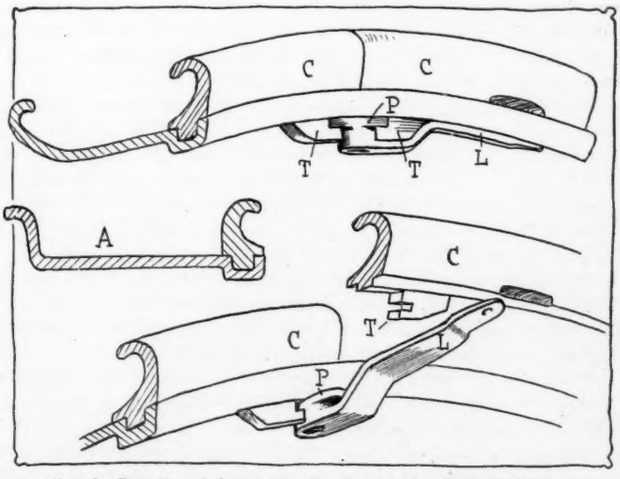


Fig. 4—Details of Stanweld Q. D. rim for wire wheels

# The Engineers' Forum

## Exhaust Gas Analysis

### Engineers Discuss Value of Analyzing Exhaust Gases To Determine Engine and Carbureter Efficiency

**Hutton and Coffin Give Results and Favor Changes**

### Part III

*Hutton Outlines Importance of Manifold*
*Coffin Wants More Air in Cylinders*

*NOTE—These discussions by leading engineers are from stenographic notes taken during the recent session of the Society of Automobile Engineers in New York City when this pertinent subject proved one of the most interesting of the meeting.*

NEW YORK CITY—The real carburetion as in the case of gasoline and air is that we propose by the velocity combined with heat that we have in the intake to get a current of air soaked with the true gas, so that the moving column of air, which is the air for combustion, shall be thoroughly saturated with the fuel that is to be burned.

Now thorough saturation, of course, is a combination of two conditions: the presence of the finely divided particles of gasoline just ready to vaporize and a mechanical mixture of those vaporized particles with the air. Now when we are thinking of passing from the carburetion of air by gasoline to the carburetion—and let me put an interrogation mark after carburetion in that sense—to the carburetion of that air with a less volatile fluid, such as kerosene, do we ever in the presence of, say, ordinary temperatures soak or saturate that current of air with the hydrocarbon gas? We may mix it together very intimately with the foggy kerosene particles in a very finely divided state; but is it possible with any non-volatile fued like kerosene to absolutely soak the current of air in the same sense in which we soak it with gasoline?

The manifold has a very important function, much so in gasoline, but even more conspicuously so in kerosene, in its operation of soaking through the air. When we once get that manifold acting slowly, then comes the function of the manifold acting as a vaporizer to help along this reluctant process with kerosene. If the manifold is too long, then comes exactly that same result as observed, that it never gets hot enough and the fog settles in the form of a deposit of rain on the bottom of the pipe. If the manifold is short and we have got it going hot and the engine is running at high speed, there is never any chance for this precipitation of kerosene fog, and we carry a product finally to the engine in full condition to burn smokelessly.

Now the problem of varying the speed of passage through the manifold, the problem of varying the volatilization of the liquid fuel, makes me want to ask whether the profession will undertake to confine the use of the term carbureter to a device which makes, without extra heat, a gas that issues from the carbureter valves. If it does not make a gas, but makes simply a fog, a mist of finely divided hydrocarbon particles in the air, I would like to refrain from calling this process carburetion. I do not think this is a true carburetion. If so, a device which uses kerosene and does not make a complete gas of it ought not to be called a carbureter, but we should find some other name for it—an atomizer or vaporizer. Well, those are two good names anyhow. But the thought that is in my mind is would it be sufficient—put it a little high—would the commercial interest permit an arrangement for atomizing kerosene, consent to have it called by some other name than carbureter? It would be scientifically more defensibe, but could it be commercially done?—Prof. F. R. Hutton.

#### Injecting Air a Great Help

Detroit, Mich.—From the standpoint of the manufacturing interests, I should say that we are principally interested in the results, and I think stand ready to welcome any carbureting device which will do the work, without much regard to whether it is indirect or direct. At least, I think the Standard Oil Company is going to force it into existence. I did a little experimental work 2 or 3 years ago which proved pretty conclusively that if it were possible to construct a motor in such a way that at the end of the intake stroke or the suction stroke, after the cylinder had filled itself with all the charge that it might take through the carbureter, that if we were able to inject into that cylinder a surplus of fresh air immediately over the top of the piston that we had no trouble in burning up everything within the cylinder, that our carbureter troubles largely disappeared and that we consumed everything, even to the cylinder oil, without leaving any residue in the line of smoke through the exhaust. As a matter of fact, we could take a spark-plug which had been deliberately fouled and which refused to work in an ordinary motor and put it in the engine with such a device and take the spark plug out after 5 minutes' running just as clean as the day it was made. This gave, I suppose, merely a condition of air and an excess of oxygen which aided in the combustion of everything which had been taken into the cylinder. We discovered, however, at the same time, that, due to the excess power we developed in that way, that it would be necessary to revise our gas engine practice in so far as construction went. In other words, our bearings were not of sufficient area and many other parts of the motor were not of sufficient strength to take care of the additional power generated. And if a charge were put into the cylinder under pressure, which would seem desirable from his standpoint of getting the speed in the intake pipe up, that then there might be a question as to whether the gas engine as it is now constructed would take care of the higher temperatures and the additional power developed. There is absolutely no question but that in so far as the cylinder contents go, it is possible to put into any cylinder, as our

gas engines are now constructed, a charge which shall be a mixture of gasoline and air which will give an explosion that will be too extreme for the parts of the engine to stand up any length of time. Putting it in there wet it is now possible to construct a motor or it is now possible with motors of our present construction, to get within the cylinder, by an addition of air at the end of the suction stroke, or by putting in the charge under pressure, a power which our current practice in gas engine construction will not take care of. We can wreck an engine as we now build it with such practice. I do not know that there would be any difference in taking in a charge under pressure, a pressure applied beyond the carbureter, reaching through the intake pipe into the cylinder, or as we did it, taking the charge, ordinary charge, through the carbureter fairly rich, perhaps, but anything that is so arranged that the piston at the extreme bottom of its intake stroke would open up every part, which would admit air at a pressure of 10 or 15 pounds per square inch, and thereby fill up the vacuum, any remaining vacuum—I use vacuum in the term that there is some portion of the cylinder which of course is not filled through the carbureter. As long ago I think as 9 or 10 years back, in a series of experiments which were conducted in the laboratory at the University of Michigan, we found that piston displacements were not by any means being filled under the method of carburetion which we were using then, and which we still use to-day. We found that our charges filled in something like 90 per cent. of the piston displacement at low speed, down to 55 or 60 per cent. of the possible piston displacement at fairly high speed, and of course we found a great many other things which we probably did not understand as well then, as to the inertia of the gas column, and so forth. But we did satisfy ourselves that we were not getting the gas into the cylinders, because the friction through the valves, the friction of the intake pipe, the restricted passages from one end to the other—and that same situation holds, I think, to-day, and it is probably just as well for gas engines as we now build them that it does hold. Otherwise I think that we should have to change our ideas of design quite materially.

The addition of fresh air at the end of the suction stroke, thereby completely filling the cylinder and adding oxygen and aiding in the combustion of air within the cylinder, will give such an increase of power that the engine will not take care of it.—Howard Coffin—Hudson Motor Car Co.

### Where Much Heat Is Lost

New York City—One-third of the money we pay for gasoline is literally thrown into the winds of our radiator cooling fan. For every dollar we pay for fuel we get back less than 15 cents worth of ride. Any man would fire a laborer who worked at the rate of $1 worth of effort for $7 hard cash in wages, yet this is what we get from our mechanical servant, the gas engine, and we are not merely satisfied but delighted.

Owing to the unfortunate habit of water to boil whenever it reaches a temperature of 212 degrees Fahrenheit or less we are compelled to keep the cooling water to the safe and sane temperature of 180 degrees Fahrenheit in order to allow ourselves a slight margin of safety whenever the slope of the ground becomes excessive. This is one source of lost energy. It is the greatest source, too, constituting as it does 30 per cent. of the total heat value of the fuel. What can we do to chop off a few per cent. from this and add the percentage gained here to the percentage that forces the car over the ground? Evidently we can do nothing as long as water is used unless some kind soul discovers non-boilable water or some other miracle happens. Leaving this matter for the few remaining air-cool advocates to gloat over, the next big source of loss, the heat thrown into the muffler, may be mentioned.

It is, of course, thoroughly understood that the exhaust of a gas engine is going to be hot from now until gas engines are no longer in use. The muffler will never be used as a refrigerator for tired tourists' lemonade, etc. The problem is not to take from the exhaust what may be called the liberated heat, but to take from it the heat that still remains bottled up in the form of combustible products. If we had a log fire in a cold room and the fire persisted in going out before the fuel was consumed we would know that there was something wrong and that conditions in the grate were not such that were most conducive to a successful fire. When we throw carbon monoxide into the muffler it is like dragging a half-burned log out of the grate and throwing it away.

The entire secret of good combustion is enough air. What is considered by chemists as sufficient to cause perfect combustion for a given weight of charge will not do. The air must be plentiful enough to be in contact with the burning particle. There must be more than enough. Therefore to stop the loss of power into and through the muffler it is up to the driver to furnish plenty of air by proper carbureter adjustment. Why not inject excess air into the cylinder anyway? Cannot our engineers find a way to do this? A few who have experimented will vouch for the good results and the increase in thermal efficiency. —Carl Vechter, Unattached.

## Harking Back a Decade

From The Automobile for February 14, 1903:

Some difference of opinion between the Automobile Club of America and the National Association of Automobile Manufacturers has at times been surmised, but has usually been well smoothed over in the interest of the moral effect of a united front by the two leading automobile organizations. Until the Madison Square Garden show, held under their joint auspices, was over, the external appearance of harmony was preserved, but no sooner had this affair been successfully pulled off, before an open declaration of disagreement in views was made by the manufacturers' association in the form of a resolution expressing disapproval of the most important event projected by the club.

But from the outside the resolution by the manufacturers looks as a deliberate challenge to the club to hold no automobile contests in the future without first obtaining the sanction of the manufacturers' organization; in other words, to keep its hands off the development and encouragement of the industry, in general, and limit its activities to matters of sport; failing in which the two organizations will have to measure strength.

With some local variations the display of new automobiles and automobile appurtenances which was placed before visitors at the New York show, is now spread under the eyes of another community, and is being judged by another public. A half dozen Western manufacturers of complete automobiles whose absence from the New York event was deprecated, are exhibiting their products in the Coliseum in Chicago, and a score of their Eastern colleagues, satisfied with the results obtained at the Madison Square Garden, are refraining from further effort. But outwardly the two exhibitions are of the same size and of the same character, though running a little more to parts and accessories in Chicago and little more to complete vehicles in New York City.

The annual meeting of the National Association of Automobile Manufacturers was held on February 4 in New York City and Milton L. Budlong was elected president; H. Ward Leonard, Windsor T. White and Charles Clifton, vice-presidents. Percy Owen was re-elected treasurer and the re-election of Harry Unwin as secretary was ratified.

The Automobile Club of Great Britain and Ireland is loath to give up all hope of holding the race for the Gordon Bennet cup on British soil, and through its latest efforts the club has discovered a stretch of road of over 150 kilometers in length in Ireland, which it has pronounced fully satisfactory as to condition. This road lies in the Province of Leinster, the start being at Naas, some 30 miles southwest of Dublin.

# Copper Alloys for Motor Car Service

## Copper, Tin, Zinc and Lead the Basic Ingredients of Bronze and Copper Alloys; Properties Important

Paper Presented Before the Detroit Section of the S. A. E. by W. H. Barr, Chairman of the Alloys Division

IN offering a paper on copper alloys one approaches a subject of such magnitude that it can only be treated briefly, in a manner that may prove of interest and service to automobile engineers.

The basic ingredients of bronze and copper alloys are, of course, copper, tin, zinc and lead, and we will consider these metals from a viewpoint somewhat unusual.

Men of mechanical training, especially those who have not made a study of metallurgy, are always interested in knowing something of these virgin metals, their origins and their effect upon each other when brought into alloys or combinations.

Copper was probably the first metal used by the human race. Weapons and ornaments have been found which seem to prove that the men of prehistoric ages made use of it on account of the ease with which it could be worked, and the fact that it was found in the ground in the metallic state. It is claimed by many that its use antedates that of iron.

The copper mines of Wady-Magrah, located in Upper Egypt, are thought to have been worked as early as the second dynasty, upward of 3000 B.C.

The Romans claimed that their best copper was obtained from Cyprus, an island in the Mediterranean, and for this reason the metal was known as "Cyprian Brass"; later, the contraction to "Cuprum," and then to "Cuper," from which our present term "Copper" was derived.

**In the United States copper is usually classified in three grades: Lake copper, that brought from the Lake Superior region; electrolytic copper, that refined by the use of electric current; casting copper, that which is not entirely refined, but carries varying amounts of impurities,** and as a result is rapidly disappearing from the commercial fields.

In bronze and brass alloys copper is the preponderant metal, being the element with which we can best alloy smaller quantities of other metals. The essential characteristics of copper are to impart strength and toughness, and in ornamental work varying degrees of rich red color. It is the best conductor of both heat and electricity, slightly excelling silver in the latter respect.

**Chemically pure silver was for years believed to have the highest electrical conductivity of all the metals, and accordingly was the basis for the 100 per cent. standard. Recently, however, copper has been produced in so excellent a state of purity as to indicate an electrical conductivity of 104 per cent. was silver as a base.**

The United States produces more copper than any other country, or about 65 per cent. of the total production of the world, the total amount for 1911 having been 1,090,000,000 pounds. The first mine worked in the United States was the Simsbury Mine, of Grandby, Conn., in 1705, which proved to be of little value and only small amounts of copper were taken from it.

The specific gravity of copper is 8.82; melting point 1,981.5 degrees Fahrenheit, United States Bureau of Standards; the tensile strength varies with the physical condition, producing the following results: In cast copper the tensile strength is 26,000 pounds per square inch; in bolts 34,000 pounds, and in wire 55,000 pounds.

The tempering of copper has for years been considered a lost art, but among the latter-day scientists the unity of opinion is that this climax of the art never existed.

Tin was first known about the time of Moses, or about 2000 years B.C., and it has been produced in varying quantities ever since. Tin was imported by the Phenicians from the British Islands long before the Christian era. These islands were, on this account, known as the Cassiterides, from the Greek word Kassiteros, meaning tin.

**Tin stone, which is an oxide of tin, is, at the present time, the only ore used for the production of metallic tin, and is found in the largest quantities in the Malay Peninsula (Chinese) and the Island of Banka (Dutch East Indies).**

**The total world's production of tin in 1911 was 233,504,000 pounds, of which the United States consumed about 40 per cent.**

Tin is a white metal with a distinctly yellowish tinge, and can be rolled into very thin sheets, but its low tenacity prevents its being drawn into wire. Its specific gravity is 7.29, melting point 449.4 degrees Fahrenheit, United States Bureau of Standards. It has a distinctly crystalline structure and emits a peculiar crackling sound on being bent back and forth, due apparently to the rubbing of the crystals on each other.

The smelting is a comparatively simple operation, as the oxide is readily reduced by carbon at a red heat. The purest metal is obtained from reverberatory furnaces. This is further refined by liquidation, which consists in subjecting the metal to a low temperature on a sloping hearth, where the tin, having a low melting point, runs out, leaving the impurities behind.

Tin produces a decided tempering effect in combination with copper, varying in proportion as it is used. Above 25 per cent. tin, the alloy is too hard and brittle for use. The true bronzes are alloys having these two elements as their main constituents. Up to about ten or twelve per cent. tin, the material is not affected by quenching. Above that percentage quenching from the proper temperature renders the alloy softer than if slowly cooled, being directly opposite to the effect which such treatment has on steel.

Tin also has a high coloring effect on copper, a very small quantity being distinctly discernible.

**Tin, in combination with the brasses or copper zinc alloys, when present in small amounts, renders the alloy more sound, more fusible, and capable of taking a better polish.**

Zinc, commercially called spelter, is the next important metal. It is of a bluish white color and of a decided crystalline nature and at ordinary temperature is quite brittle. Between 250 degrees and 300 degrees Fahrenheit however, it is malleable enough to permit of rolling into thin sheets and drawing into wire. Zinc is not found in a free metallic state, but is obtained from its ores, which are chiefly sulphide of zinc and carbonate of zinc. The concentration of the ore is attended with considerable difficulty, as the associated impurities are generally of about the same weight as the ore.

**The specific gravity of cast zinc is 6.87; melting point 786.9 degrees Fahrenheit. It is a poor conductor of both heat and electricity.**

**The United States is the largest zinc producer of the world, New Jersey, Missouri, Kansas and Colorado containing the greatest deposits. Our total output in 1911 was 623,122,000 lbs.**

Of the different metals that we are considering, zinc is the only one that can properly be called a bearing metal. Used unalloyed for bearings where strength is not essential and its brittleness is not objectionable, there is probably nothing superior to it for wearing qualities.

### The Effect of Zinc and Lead

**Zinc in combination with copper produces the brasses. Very small additions of zinc render copper suitable for casting.** Larger additions cause gradually increasing hardness, but not to as marked an extent as tin. Nearly fifty per cent. zinc can be added before an alloy too brittle for use is obtained. With increasing zinc contents the strength and elongation, as well as the fusibility of the alloy, increases.

In the high copper-tin bronzes zinc is used in small quantities of about one or two per cent., mainly for a cleansing effect. It improves the fluidity of the metal, thus making sharp, clean castings, free from blow holes.

With a higher percentage, the hardness and strength of the bronze decreases, and the brasslike qualities thereby imparted become apparent.

Lead has been known from remote antiquity. It is mentioned in the Bible at a period of about 3000 B.C., and articles made from the metal by the Ancient Romans, in the form of water pipes, tanks, rings, etc., are still preserved. Many European countries produced lead as early as the tenth century and still supply the market. **The United States leads the world at present, the annual production for 1911 having been 795,628,000 lbs., or about forty per cent. of the world's production.** The first lead in the United States was discovered near Jamestown, Va., in 1621, but the present main supply and the richest ores are obtained from the Western States. The principal ore is the sulphide called Galena, which almost invariably carries a small percentage of silver.

**The specific gravity of lead is 11.35; melting point 621.1 degrees Fahrenheit, United States Bureau of Standards; tensile strength 2000 lbs. per square inch.**

Lead, in combination with copper, is exceedingly difficult to introduce in its best form and remains undissolved as inter-crystalline material. It is, therefore, not an alloy, but rather a mechanical mixture.

The action of the lead in combination with a copper tin bronze is as a lubricant, the small free globules of lead in a bearing being very beneficial.

Although lead makes the alloy denser and more malleable, it has a decidedly weakening effect upon the alloy, as its globules break up the continuity of the crystals. A high lead bronze when broken will show a gray fracture as a result of breaking through the weaker lead globules and not through the crystals of the copper tin mixture.

## Phosphorus a Cleaning Agent

In brass, lead also acts as a lubricant and prevents fouling of the tools in working.

Some elements, such as arsenic, antimony and sulphur, have a detrimental influence on bronze, but there is one which has a decidedly beneficial effect, and that is phosphorus.

**The function of phosphorus on a bronze is that of a deoxident. It cleans the metals from oxides of copper and tin, and if the correct amount is used for this purpose none remains in the finished alloy.** By the removal of these oxides the bronze is rendered more fusible and better castings are possible.

Larger additions of phosphorus harden the metal, but at the expense of toughness. The production of various qualities of phosphor bronze depends more upon the proper proportioning of the various ingredients than upon the quantity of phosphorus.

One of the problems which must be contended with by the sales department of a brass foundry is the lack of information about phosphorus, which results in ridiculous specifications, often asking for phosphorus as high as ten per cent. The specification of phosphorus can with safety be left only to the metallurgist, instead of the ordinary brass foundry foreman, who usually relies entirely upon guesswork. Phosphor bronzes should be secured only from companies of reputation, who make a specialty of their manufacture.

High copper alloys, as related to motor car construction, may be divided into four classes:

1—Soft Phosphor Bronze.
2—Hard Phosphor Bronze.
3—Red Brass.
4—Yellow Brass.

**Soft bronzes in general are low in phosphorus and high in lead,** the former being used solely as a purifying or deoxidizing agent. **This class of bronze can only be considered for bearings, the high percentage of lead reducing the tensile strength of the alloy, so as to make it unsuitable for severe strains.** Under this head may be mentioned one of the standard S.A.E. alloys, 80 copper, 10 tin, 10 lead. This combination is generally used throughout all motor car construction, and present practice among the best makers finds use for the alloy in a number of places.

It is difficult to recommend a particular alloy to render the best service in any part of a motor car without the specific knowledge of conditions covering its use. Before making an intelligent selection it is necessary to know the bearing pressure, character of lubrication and vibration, as well as the nature and quality of the steel which is used in the rotating piece.

**Those phosphor bronzes commonly described as hard are generally high in both phosphorus and tin, and low in lead contents. In those cases where the phosphorus contents runs as high as one and one-half per cent. the tin content is necessarily under twelve per cent.,** or the alloy would be too brittle. The reverse is also the case, and where alloys contain a mixture of approximately 80 copper and 20 tin, the phosphor contents should not be over one-half of one per cent. An alloy of this character is used to withstand heavy pressures and has no place in motor car construction.

Among the high copper-tin bronzes may be classed the gear bronze most generally used in the United States and abroad, being an alloy of 88 or 90 copper, and from 12 to 10 tin. No standard gear bronze has yet been adopted by the Alloys Committee of the S. A. E., owing to a lack of unanimity of opinion as to what is best to recommend. A few prominent manufacturers of bronzes of their own special formula, which in many cases they believe to be superior to a formula of 88-12 or its approximate. **The composition of 90 copper and 10 aluminum has proven one of the most successful gear bronzes on the market, having an average tensile strength of 60,000 lbs. per square inch, and wonderful bearing qualities.** It has not been generally used owing to the difficulties encountered in its manufacture, only one or two makers having solved the problem of producing perfect castings. The alloy of 88 copper, 10 tin, 2 zinc, probably the most prominent of the United States Standard alloys, fills many requirements most satisfactorily, and for all around use is hard to improve on.

Red brass, commonly known as "Composition," contains a maximum of 85-86 per cent. copper. In this way it can be differentiated from the bronze class. Too often red brass is only an excuse for a visit to the scrap pile on the part of mediocre brass foundrymen, where the scrap is selected with varying degrees of care, depending largely on what the customer will stand for. Fortunately, this condition is being remedied, and that type of brass foundrymen eliminated, through the demand by automobile engineers for a brass of uniform color and texture.

**One of the standard alloys which has given excellent satisfaction is 85 copper, 5 tin, 5 lead, 5 zinc. This alloy has an excellent color and may be used in motor car construction where severe bearing necessities of great strength is not a requirement.**

Yellow brass may be sub-divided into two classes, one being the type of brass used generally for ornament. The other is manganese bronze, in which the percentage of copper and zinc runs close to yellow brass. Its tensile strength and other remarkable properties are brought about through the use of small quantities of iron, manganese, aluminum and tin in varying proportions. Manganese bronze being very generally used either for experimental or permanent construction, should not be passed without a comment.

If it is the intention to use the casting where rigidity is required, the manufacturer should be so advised. By slightly changing the composition of manganese bronze, it is possible to alter its rigidity and consequently its ductility to a marked extent. In specifying manganese bronze castings, it is wise to adhere to established brands, particularly where the work is being done by your own or a local foundryman who perhaps lacks the metallurgical knowledge necessary to produce or judge a good ingot metal. Unscrupulous refiners of scrap metals frequently offer for sale, under the name of manganese bronze, an ingot which would be decidedly out of place in a yellow brass classification.

**Manganese bronze may be used for practically all brackets, foot levers, radiator braces, and all external parts requiring strength in the body. This covers the brakes, lugs, levers, hubs, spider, steering yokes, fan pulley, dust covers, plates, brake lugs, windshields, handles, supports, hinges, buttons, latch, foot adjustment, quadrant, and any parts (not bearing parts) which require the strength of high grade steel.**

The correct practical solution of the severe bearing requirements on the modern high-speed gasoline engine is of the utmost importance. In designing engine bearings there are two important conditions that must be taken into consideration.

First, the selection of a proper alloy, having the requisite anti-frictional qualities, and secondly, the selection of a metal having the necessary physical properties as regards strength and resilience.

## Requirements of Bearing Metal

A soft babbitt may have the antifrictional requirements necessary for gasoline engine service, though owing to its plastic nature its physical properties render it unsuited for the work. On the other hand, a bearing made entirely of steel would have the necessary strength and resilience, but would be anti-frictional. These anti-frictional qualities are so obviously imperative that in nearly every case these have been considered at the expense of the mechanical or physical properties of the bearing. Soft babbitts have been discarded, and for the reason stated, harder babbitts have been substituted; in many cases the die cast bearings have become generally used as crank bearings in some classes of motors.

In the light of the foregoing facts, **it is not a difficult task to design the ideal bearing, for it resolves itself into combining the best anti-frictional qualities with the highest physical strength and resilience.** These qualities have not been found in any one metal or alloy now known.

It therefore becomes necessary to unite these characteristics in a bearing and this is done by adopting the old-fashioned babbitt lined bronze shell of a modified design. For the bearing surface requirements we select a high tin, so-called genuine babbitt, containing about 90 per cent. tin and approximately 5 per cent. each of antimony and copper.

For the necessary physical property we shall select a copper tin bronze having high strength and resilience. The constituents of this bronze should be so proportioned that upon cooling from the molten to the solid state there is no eutectic formed; that is, no small portions of the alloy may have a lower melting point than the greater part of the mass.

# Systems for Salesmen Becoming Popular

## Methods of Checking Force Engage the Attention of Most Up-to-Date Concerns

SALESMEN'S work systems for recording the doings of all men from day to day are now in far from common use, although they are constantly increasing. The reason is that many companies, especially those selling high-priced cars, do not wish to put the sales force to any unnecessary trouble, since the number of customers is naturally limited on account of the price of the ware. Where a medium or low-priced automobile is being sold, however, exact records must be kept of the work of all men; not so much for controlling the work done by the men, but for the purpose of knowing with whom the company deals. Likewise, the advantage of a work-recording system overcomes such weak sides of the one-man idea as the difficulties growing out of one man's resigning his position with the company. Finally, the increased orderliness in carrying on the business, has an advantageous effect on all employees connected with that end of the concern. Thus, a number of reasons make the use of such a system desirable.

It hardly remains to be said that not only the factory branch profits from systematically executed work, but that the salesman does as well. It is easier for him to oversee his work, to avoid missing an appointment, to follow up the good prospects and drop the others in due course, to economize on his time and temper, and to make more money in a more pleasant way in a shorter time than otherwise. All these advantages should tend to make salesmen favorably disposed toward systematic recording of their work.

The forms used for recording salesmen's doings are as different as the companies are many. In every case sales contracts, card files, daily or weekly sales reports are used. Besides these, reports of the calls made every day are frequent practice.

Special interest attaches to the system of the Ford branch in Long Island City, N. Y., as this company, representing the Ford Motor Company in the Metropolitan district, naturally does a tremendous amount of business. In many respects, this system resembles others already described—see THE AUTOMOBILE, November 21, 1912—but among the forms used are two which are quite original and should prove of interest to dealers of low-priced cars and business men using such cars. These forms are the salesmen's daily report and the dealers' weekly report.

The salesmen's daily report which is made out in duplicate is a blank, printed on thin white paper, 8.5 inches wide by 11 inches deep and printed in black. Besides the company's letter-head design printed on the top and a space for date and salesman's name, the sheet offers room for the recording of six visits, with all the necessary and desirable details. The name, residence, business address, business and telephone number of the prospective customer are recorded; furthermore, there is space for the make of the car—if any—which he owns at present, together with the model number and its value. Besides, the salesman notes on this form, in which model—touring car, runabout or what else—the party seen is interested. The hour at which the visit was made, the date and hour of the next appointment and eventual remarks also find space on this blank. Some of this information, like the hour at which the party was called on, might seem like superfluous records; but they are not. The time at which a man may be expected to be at his office or home is generally the same every day. Another point should be brought up in this connection. The value of the car used by the prospective owner when seen by the salesman is recorded; but the Ford

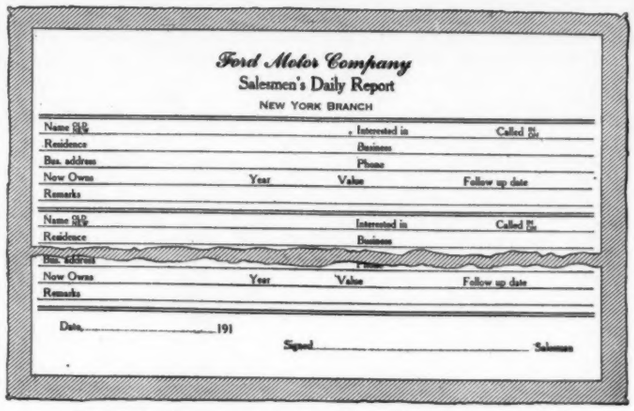
Ford Motor Company
Salesmen's Daily Report
NEW YORK BRANCH
Name
Residence
Bus. address
Now Owns
Remarks
Interested in
Business
Phone
Year
Value
Called
Follow up date
Date, 191
Signed
Salesman

Fig. 1—Salesmen's daily report used at Ford branch

company does not take any used cars in exchange for cars sold by it; nor does it allow a discount on the price of the new car. This information is put down simply for the purpose of notifying a used-car dealer who is to sell the car for the account of the purchaser of a new car. Outside of this act—which is purely one of assisting the purchaser in a business of his own—the Ford people take no steps to dispose of used cars and the purchase of a car is the same whether it is the first, second or tenth car bought by any given party.

Each salesman's report is made out in duplicate, one copy being held by the salesman and the other going to the office of the company, where the information is transferred to a card file, containing it on cards marked with the names of the prospective owner. There is also a system for the purpose of insuring all dates being kept and prospectives properly followed up.

Besides the salesmen's report, the above mentioned dealers' weekly report is of interest. This report is made out—in duplicate—by every dealer served by the Long Island branch and a copy is mailed to the branch at week end. The purpose is not only to keep the branch informed of the number of cars held in stock by each of its dealers every week, but also of the names of the people who buy Ford cars, furthermore, of the specific cars sold. As Fig. 2 shows, this sheet is designed for the recording of the motor and car number of each automobile sold, the date of sale, the name of the purchaser and his address. Besides, the dealer states whether the buyer is a sub-dealer or the ultimate user of the car. The latter point is for the purpose of obtaining, from the sub-dealer if such buy the car, the name of the ultimate purchaser. Furthermore, when repair parts are demanded by a dealer for a car in his territory, the company may look up its records and find out whether the user is the purchaser to whom the car was originally sold or not. Incidentally, the sheet affords an opportunity of checking a dealer on his territory, that is, of finding out whether he passes over its limits or not. The sheet affords space for entering twelve transactions, and at the right end, there is space for making a record of all cars unsold on hand, with the car and motor numbers, which, of course, must also be sold by the dealer who sends the record, in course of time.

This sheet is 11.5 inches wide and 8.5 inches high. The print is black and the ruling red and blue, the paper thin and greyish white. The company, after receiving this record, files it, having incorporated the names it contains on its owners' list. The records are filed by the names of the dealers, and all records sent in by one dealer in the order of the dates, so that it is easy at any time to find any dealer's record for any week.

These records, of course, facilitate the handling of a large business to a great extent. Of course, to sell a car as cheaply as possible, up-to-date manufacturing facilities are a prime necessity. But an efficient sales scheme is an important requisite. After all, not to create only; as the poet of industry, commerce and activity says; but to work out in detail, finish up and realize the plans which are prepared, in concrete shape, by the factories.

# Communications from The Manufacturer

## Manager of Abbott Motor Company Does Not Believe in New York and Chicago Shows

DETROIT, MICH.—Editor THE AUTOMOBILE:—That the annual automobile shows as now conducted, especially the New York and Chicago events, have lived their day and fulfilled their original purpose, is the absolute conviction of the majority of automobile manufacturers. Until the past few weeks few people with authority and influence have felt free to publicly express their views on what heretofore has been considered a delicate subject. The promoters of these shows have been very anxious to suppress anything that has been set afloat that would have a tendency to cause any indifference or unfavorable action on the subject. However, the day has fully arrived when manufacturers are declaring without reservation that the usefulness of these events has already ceased and that they are no longer willing to give their influence and support to this economic waste. It is a well established and accepted rule of political economy, based upon good common-sense, that when a thing has fulfilled the purpose of its existence and become useless, it should at once die a natural and honored death, and give way, if conditions so dictate, to something else. This applies to automobile shows.

The necessity of these events has ceased to be a fact. During the earlier days when the industry required all the encouragement and assistance that could be given it, they were unquestionably a good thing, but the public attitude has changed and the day of educational campaigns to teach people the utility and importance of the motor car has ceased. There is now little more logic in holding these periodical exhibitions than would justify a similar display of railway coaches and street cars.

A few years ago we had "shows" in a very acceptable sense of the term, but not so any longer. Then the new models were not made known until they were displayed at the New York show, but now practically all manufacturers are announcing their respective lines not later than August, and many have ceased to make these announcements altogether. Anybody with any degree of interest now attending these shows, well knows just what he will see. The models shown are for the most part those which have been on the streets from 6 to 8 months.

After as careful analysis of trade conditions as possible, I have been unable to discover any real demand for the annual show. The situation seems to be that while the majority of manufacturers have had their own private convictions in the matter, each has disliked to be the first to take a definite step, not knowing for a certainty in just what light their position might be regarded. Few, if any, of these manufacturers feel that the returns are commensurate with the enormous expenditure intailed and the wisdom of continuing the practice is strongly questioned. Floor space is charged for at extortionate rates and the numerous other expenses incurred amount to a small fortune for each fair sized show. The millions of dollars poured into New York, Chicago and the many other places, is of necessity almost entirely borne by the automobile industry. It has been pointed out by Col. Albert J. Pope, president of the Pope Manufacturing Company, that 60 per cent. of the gate receipts at the Madison Square Garden in 1912 were paid by the industry and that the percentage was even greater at the last show. Besides, these tickets not only pay the rent and decorations but a large percentage of the patronage as well.

Col. Pope also calls attention to the disorganization of the factory and sales departments and business in general during the weeks of the shows, and declares that it is a serious subject that will have to be reckoned with in the near future by the automobile industry. Objection is again made to squelching by the newspapers for large spreads of advertising, which if used at more logical times would bring incomparably greater returns.

The automobile manufacturers are greatly indebted to Col. Pope in taking the lead in the more improved conditions as regards this matter of the shows. The industry cannot afford to incur such expense as are incident to the part participation in such shows as are held at New York and Chicago. The public realizes with a fair degree of accuracy what an enormous amount of money is intailed in this expenditure, and the industry is being criticised severely by sound business men on the outside as a result of this apparent economic waste; and further, that if the industry can afford a performance of this kind as a result of the net return to the business in general the funds so appropriated should be retained by the industry and the buying public given the benefit of same in reduced prices of the product.

It is my firm belief that the time has come when the industry can abolish the matter of automobile shows in New York and Chicago in the winter time without suffering anything in the way of reduction in the total amount of automobile business done in the country. If in the opinion of all manufacturers an automobile show should be held it should be held in the summer season at about the time the manufacturers introduce their new models and hold just one show, and that at some point outside of both New York and Chicago, preferably Detroit.—M. J. HAMMERS, Abbott Motor Company.

Ford Motor Company

DEALERS WEEKLY REPORT

DATE_____ 191__

DEALERS NAME_____

ADDRESS_____

IN ACCORDANCE WITH OUR CONTRACT WE HEREBY SUBMIT OUR CAR REPORT FOR THE WEEK ENDING_____ 191__

| SALES | | | DATE OF SALE | SOLD TO | TOWN AND STREET ADDRESS | COUNTY | STATE | STATE WHETHER THE PURCHASER IS A SUB-DEALER OR OWNER | ON HAND UNSOLD | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MODEL | CAR NO | MOTOR NO. | | | | | | | MODEL | CAR NO | MOTOR NO. |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
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IMPORTANT—ACCORDING TO YOUR CONTRACT YOU WILL PLEASE MAIL THIS REPORT TO THE FORD MOTOR COMPANY AT_____ IMMEDIATELY AFTER THE CLOSE OF EACH WEEKS BUSINESS

INCLUDE ALL SALES WHETHER DELIVERED FROM YOUR STOCK OR SHIPPED DIRECT TO YOUR CUSTOMER BY THE MANUFACTURERS.

Fig. 2—Dealers' weekly report used for statements of sales and cars on hand sent to Long Island plant by dealers


# Leaky Exhaust Manifold—New Bushings Around Valve Stems—Believes in Right Drive—Putting Gasoline Tank Under Cowl—Changing to Demountable Rims—Reduction of Drive Through Friction Disks—Portable Racks for Wagons

## Leak Around Exhaust Manifold

EDITOR THE AUTOMOBILE:—I have a motor that leaks around the point where the exhaust pipe joins the cylinder. I have tried to fix this but it remains in spite of anything I do. I attempted to caulk the leak with asbestos packing but was unsuccessful. What is the cause of a leak of this nature and how may it be stopped?

Allentown, Pa. WILSON PETERHOFF.

It will sometimes happen that the stirrup which holds the manifold to the cylinder will become warped and allow the gases to escape from around the juncture of the manifold and the cylinder. The point at which the warping takes place is that shown in exaggerated form in Fig. 1. This can be remedied by applying a new stirrup.

If the stirrup is not warped or the manifold is not applied in this manner a new gasket should readily stop further leaks. Secure a sheet of gasket paper of the correct size from any accessory dealer and lay it over the joint to which the gasket is to be fitted as in Fig. 2. Gently tap around the gasket with a hammer. The rim of the opening to be fitted will leave a mark on the gasket. By the aid of this the gasket can be cut with a sharp chisel or knife as in Fig. 3. The finished gasket should then be placed in position and the parts replaced. The finished job should have an even appearance all around. The gasket when properly fitted against a smooth surface will not permit any escape of gases at the joint.

It is impossible to caulk a leak of this kind. In fact it is dangerous as it would be very easy to spoil the motor by forcing some foreign matter into the cylinders which could get caught between the piston and the cylinder wall and score the latter. A warped stirrup is a rare occurrence and shows bad work.

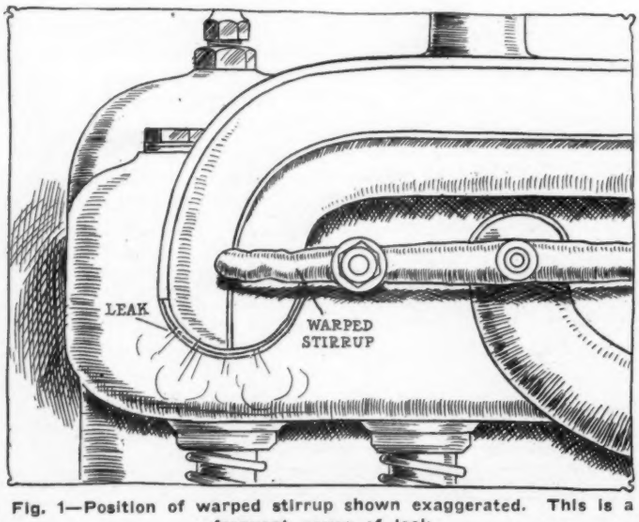


Fig. 1—Position of warped stirrup shown exaggerated. This is a frequent cause of leak

## Rebushing Valve Guides

Editor THE AUTOMOBILE:—1—Would it be good or bad practice to bush the worn exhaust valve stem guides, of any standard motor, with brass or bronze bushings? Is there any material that would be better for this purpose?

2—What is the process of making malleable iron castings?

3—What is the distinction between gasoline and benzine?

Dixfield, Maine. T. P. H.

—1—Rebushing with bronze would be good practice and would be more satisfactory than anything else.

2—The process of making malleable iron may be summarized as follows: The proper cast irons are melted in either the crucible, the air furnace, the open-hearth furnace, or the cupola. The metal when cast into the sand molds must chill white or not more than just a little mottled. After removing the sand, they are packed in iron scale or other materials containing iron oxide and subjected to a red heat (1250 to 1350 degrees Fahrenheit) for over 60 hours. They are then cooled slowly, cleaned from scale, chipped or ground, and straightened.

When hard, or just from the sand, the composition of the iron should be about as follows: Si, from 0.35 to 1.00, depending upon the thickness and the purpose the casting is to be used for; P not over 0.225, Mn not over 0.20, S not over 0.05. The total carbon can be from 2.75 upward, 4.15 being about the highest that can be carried. The lower the carbon the stronger the casting consequently. Below 2.75 there is apt to be trouble in the anneal, the black-heart structure may not appear, and the castings remain weak. A casting 1 inch thick would necessitate silicon at 0.35, and the use of chills in the mold in addition, to get the iron white. For a casting .5 inch thick Si about 0.60 is the proper limit, except where there is danger of getting heavily-mottled if not gray iron from the sand molds, and this material, when annealed the long time required for the white castings, would be ruined. For every thin casting Si can run up to 1.00 and still leave the metal white in fracture.

3—There is no definite distinction between benzine and gasoline as far as the oil trade is concerned. If you asked a company to quote you on benzine, they would quote you on gasoline. Four or five years ago gasoline was anything above 70 gravity. Now it is anything above 60. What gasoline is, is fixed by the demand for it and the state of the trade. Very often benzine is taken to mean gasoline in the raw state. That is, before it has gone through the final refining process.

## Protests Against Left Drive

Editor THE AUTOMOBILE:—I contend that the left-hand steer is not in accord with true mechanical skill. To illustrate, if a person running an automobile sees a large one coming towards him from the opposite direction and he wishes to avoid all chances of an accident he should be on the right-hand side so as to see how near he can run to the gutter and not enter it; that takes care of the automobile that is approaching him. Again, if you wish to pass an automobile going the same way you should

be on the right side of your automobile so as to see how near you are going to the vehicle you are to pass, as the law says you must pass all vehicles on their left. That takes care of the vehicles going the same way you are.

I am well aware that in some cities there is a rule that all automobiles shall stop on the right side of the street; in that case it would, if you were in a runabout, oblige your companion to walk the immense distance of around the back of your automobile in order to reach the sidewalk. Those in favor of the left-hand drive continually harp on the trouble it puts your companion to in having to get out in the mud, as though it was always muddy, when the fact is there is not a muddy day more than one in four, and many people will not run their automobile when it is muddy, and if your car is a touring car that argument has no weight. I think the left-hand drive is a fad and the quicker it is abolished the better for the autoist.

Lynn, Mass. JOHN S. WRIGHT.

## Changing Tank Location

Editor THE AUTOMOBILE:—Is it feasible to change the gasoline tank from under the front seat to one like the Henderson car has on the dash, new tank and cowl being made, of course. Will the difference in pressure (gravity) make any difference?

Hasbrouck Heights, N. J. A SUBSCRIBER.

—It is very feasible to do this as there will be no difference at all but in the arrangement of the piping except insofar as the shape of the cowl and the tank are concerned. Any sheet metal worker will do this work for you or it would be possible to do it yourself if you have had any experience in this line. The difference in pressure due to the greater head of the gasoline will make no change in the operation of the carbureter. The float feed device on the carbureter is so designed that it takes care of the supply of gasoline furnished to the spray nozzle regardless of what the pressure on the gasoline may be.

## Changing to Demountables

Editor THE AUTOMOBILE:—I have a Mitchell car with Q. D. 34 by 3.5 wheels which I wish to change to demountable rims. Please advise where I can have change made and what type rim you would recommend.

Lewisburg, W. Va. W. D. SLAVEN.

—Any standard rim company will make this change for you at a cost of about $15 for the labor and whatever the price of the rim may be. It is necessary to cut off the spokes about an inch in the average case of making such a change and it is for this that the above amount is charged. The felloe necessary with the demountable type of rim is thicker than that used with the clincher or Q. D. and therefore the change will have to be made. Any good type of demountable rim will be satisfactory.

## Ignition of Overland Car

Editor THE AUTOMOBILE:—Would you please explain by a diagram the ignition system used on my Overland model 69?

Brooklyn, N. Y. T. E. D.

—The dry cells for starting are connected in series as shown in the wiring diagram, Fig. 4. These operate through a non-vibrating coil and form one part of the dual system. The high-tension magneto forms the other part. The wiring is as shown in the illustration.

## Mathematics of Friction Drive

Editor THE AUTOMOBILE:—I am very much interested in the friction drive for automobiles. As a speed-changing device I consider it ideal. However, there are a few points I don't understand and will thank you very much if you can clear them up for me and no doubt other subscribers will find it interesting also.

Let us take the Cartercar, for example: Suppose the driven wheel is at the outside of the driving disc and that the surface here is, say, 6000 feet per minute. Evidently the most power can be got from the friction at this point. But if we attempt to drive up a steep hill we have got to move the driving wheel in towards the center of the disc. Just when we need the most power is when we have the least as the surface speed is a great deal less as we move in. How is it possible to go up a 50 per cent. grade, as they say in the last issue of THE AUTOMOBILE. I would like to see this figured out mathematically.

Streator, Ill. JOHN DUNN.

—Theoretically the same amount of energy is available at any point on the face of the driving wheel of a friction drive. If all the energy available could be transmitted through the medium of the friction drive this would then be practically true also. As it is the efficiency of the drive varies for different reductions and the practical result only approaches the theoretical. With this in mind the explanation will be simple.

Power is the rate of applied energy. A small amount of energy applied rapidly may develop the same power in foot-pounds per minute as a large amount of energy delivered slowly. A horsepower is 33,000 foot-pounds per minute. The shaft turning over the friction wheel contains so many foot-pounds per minute of power. It delivers all of that to the friction wheel. At any point on the wheel therefore the foot-pounds per minute are the same. Since the linear feet per minute travel of the wheel is greater at the rim than near the center and the foot-pounds are the same, the pounds delivered must be less per minute. Because the foot-pounds are the product of the pounds and the distance moved through in feet. Therefore in moving the vehicle a less number of feet per minute, or in moving the friction wheel a less number of feet per minute, a greater number of pounds resistance can be overcome for the same number of foot-pounds. We secure a wheel which is moving more slowly at a given number of revolutions per minute when we lessen its diameter.

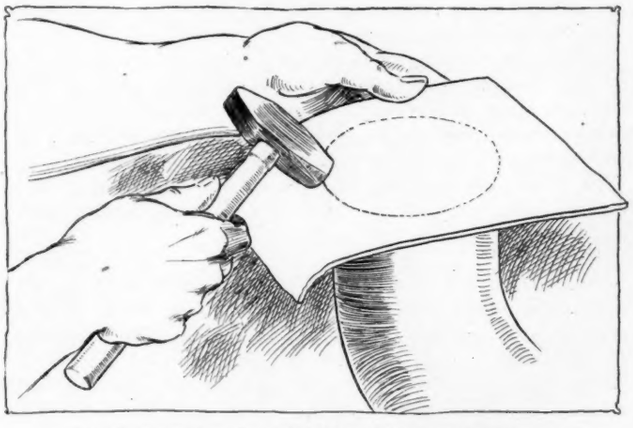

Fig. 2—Outlining the point at which to cut the gasket

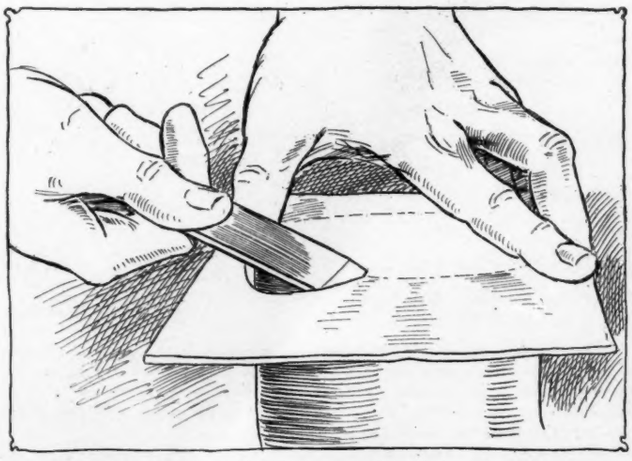

Fig. 3—Method of cutting thin gasket with sharp chisel

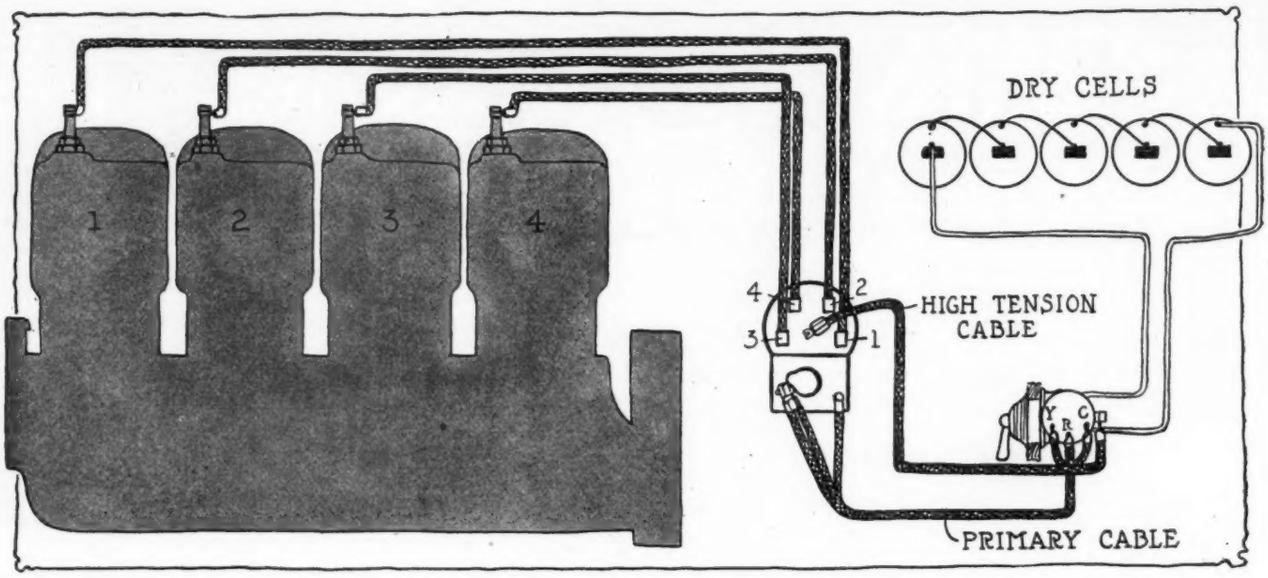


Fig. 4—Wiring diagram of four-cylinder motor using dual system, showing arrangement of batteries, switch, magneto and spark plug

The equation is as follows:

Foot-pounds per minute = pounds × feet per minute.

Therefore in a concrete example 100 foot-pounds per minute may be 10 pounds at 10 feet per minute or 1 pound at 100 feet per minute.

## Racks Used on Grocery Trucks

Editor THE AUTOMOBILE:—I am interested in a grocery business which is using two 1-ton trucks for delivering and contemplates the installation of three more.

We have been trying to figure out a practical rack which can be rolled into the trucks after being loaded with groceries and rolled out again when empty. In this way the trucks would not have to remain long at the platform for loading and could be kept running the greater part of the day.

The trouble has been that we want a rack with several shelves for rush days and want to remove the shelves when the loads are light.

Cleveland, O. N. C. GROEH.

—The easiest way to solve your problem would be to equip a small truck, which fits into the body of your truck, with a series of superimposed shelves and to roll the whole business into the truck as soon as the latter draws up in front of the loading platform. The obvious detriment of this system is that two small trucks are needed for every big truck, one being used on the truck while the other is being loaded so as to be ready when the big truck arrives.

A more economic solution is proposed in the illustrations, Figs. 5, 6 and 7. The first illustration shows a closed body, seen from the rear, the side walls of which are fitted with horizontal runways which extend all along the sides of the body. In the illustration three runways are provided and the floor of the truck body providing another runway, there is a possibility of placing four shelves in the truck. Of course, if there is no need for this number, one, two or three shelves may be used. Since, when the load is carried on roller-supported shelves, the load is carried to quite some extent by the vertical uprights which form the edges of the truck-body walls, it stands to reason that these uprights as well as the runways must be of steel and the whole system braced properly so as to be strong enough at every point. Of course, the back of the loading space is provided with a door of optional construction, and it would seem that the two-section type of door, half of which is turned upward and the other dropped, would have many advantages for grocery work.

Fig. 6 shows the small truck which is needed for transferring the roller shelve from the room where they are loaded with the parcels to be delivered to the automobile. This truck, as Fig. 6 indicates, consists simply of a platform and two sidewalks constructed with similar runways as the big truck so that the shelves carrying the goods may be placed on these runways. The spac-

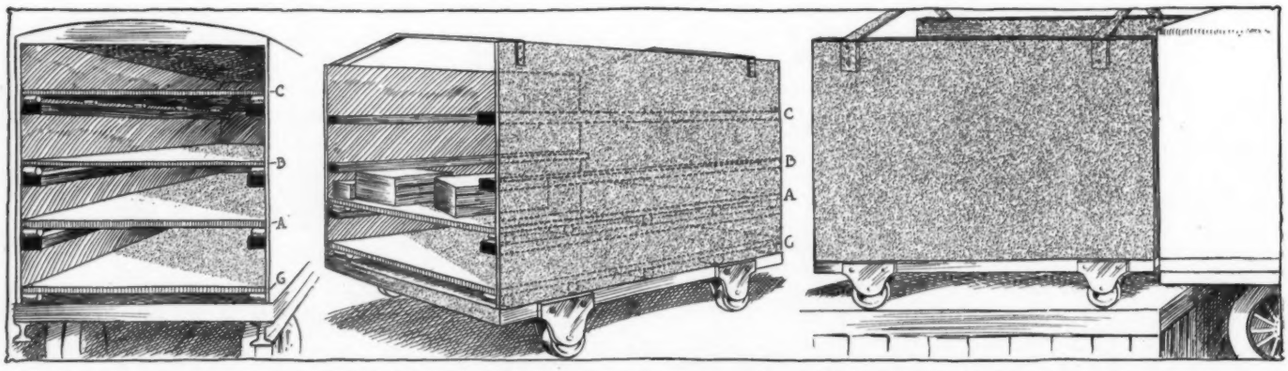


Fig. 5—Rear view of truck designed to take in shelves rolling on runways fitted to the side walls of the body. Fig. 6—Loading truck which supports the shelves carrying goods before they are rolled on to the freight automobile. Fig. 7—Schematic view of delivery wagon, loading truck and inclined platform for driving the latter up to the former. The letters on the runways shown on the automobile truck and those on the loading truck correspond with respect to the alignment seen in Fig. 7 which permits of simple transfer to the loaded platforms from the runways of the small truck to those of the automobile. If the level of the loading platform is not on just such a height as to provide perfect alignment of the runways, an incline plane and additional platform, not shown here, must be used for obtaining this alignment.

ing of the latter on the small truck is likewise the same as on the big one. Of course, the small truck must be of sturdy construction, with steel uprights, runways and overhead braces, if posssible. The best thing to do would be to order the steel body for the small truck to be made by one of the steel-shelf manufacturers, whose products were described in THE AUTOMOBILE of June 27, 1912. The running gear, that is, the wheels could be fitted in any suitable way, by means of casters held in hangers as shown by four small trucks which may be secured to the under side of the truck platform. If the big truck has a loading platform more than 7 feet long it may be necessary to put two shelves on each runway level.

To complete the equipment, the loading platform against which the automobiles abut for loading must be of such a height that the first, second, etc., runways of the small and big trucks correspond. If this is the case, loading may be done in the loading department of the store by a boy, according to standardized rules, all the roller shelves being kept on racks. Shortly before the return of a truck is expected the boy transfers the shelves from the rack to the small truck and the latter is brought near the door, ready to be unloaded to the big truck as soon as the latter arrives. Then the small truck is driven up against the big one and the loaded shelves transferred from one to the other. It is possible, by this process, to accomplish in 3 minutes what otherwise takes perhaps 30. Of course, the loading of the shelves in the loading department must be carried out according to well-proved rules so as to make speedy unloading easy.

## Suggests New Spring Suspension

Editor THE AUTOMOBILE:—You will see in Fig. 6 inclosed blueprint of a spring suspension. The object of it is to overcome the boosting of car body by allowing the end springs to oscillate. What do you think of it?

Regarding side strains I do not think there would be any more side strain on the middle spring than on the hangers of the end springs. I do not see how this type of spring could be subject to any more strain than the platform or full elliptic spring; the rods could be set at an angle so as to take most of the side strain.

I believe this form of spring would have more shock-absorbing qualities than the platform or elliptic spring. The wheel upon striking a "bump" would cause the end spring to rock, the shock being taken up by the rocker and half of center spring and doing away with the jolt of the body.

There are cars using a straight spring pivoted in the center and fastened to the frame at the pivot and inner end, the outer end being fastened to the axle. Such a type is used on the King car and would be subject to as much side strain as the spring in question.

Flint, Mich. E. M. MORLEY.

—The opinion of our readers is invited on devices suggested in these columns. The idea is to provoke a discussion of general interest and at the same time to encourage ideas brought out by those who may not be regularly employed in the business.

## Foreign Rating Formulae

Editor THE AUTOMOBILE:—I noticed the A. L. A. M. rating for horsepower in one of the last numbers. Can you tell me the European method of rating?

Marquette, Mich. A. A. YOUNG.

—There are several methods in use for rating the horsepower. This is due to the fact that the taxation on the manufacturer is based on the bore in some countries and on the horsepower in others. This condition leads to a preponderance of the long-stroke motor in the countries where the tax is by bore. In Germany the formula in common use is:

$$\text{Horsepower} = .3\ N\ D^2\ L.$$

In England the formula used for some time was the same as ours:

$$\text{Horsepower} = \frac{D^2 N}{2.5}$$

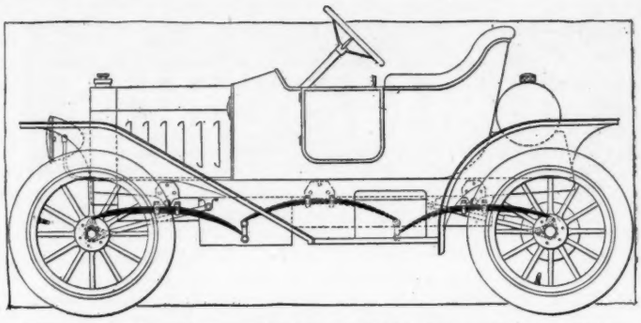

Fig. 8—Novel spring suspension suggested for comfort in driving

They have now evolved a formula which brings in the stroke factor more fully, that is:

$$\text{Horsepower} = .464\ N\ (D + L)\ (D - 1.18).$$

In France they are beginning to use a formula which brings in the most efficient speed of the motor. They are somewhat up in the air at present, however, owing to the fact that they are trying to find a good fiscal formula which will serve the purpose of taxation. The French believe in a different formula for different classes of vehicles. For touring cars of the ordinary type the following formula is used:

$$\text{Horsepower} = \frac{N\ D^2\ L\ S}{2 \times 10^6}$$

For high-speed touring cars the formula is:

$$\text{Horsepower} = \frac{N\ D^2\ L\ S}{1.9 \times 10^6}$$

For commercial vehicles the formula is still further modified to:

$$\text{Horsepower} = \frac{N\ D^2\ L\ S}{1.8 \times 10^6}$$

In all of the above formulæ, D = the diameter of bore of the cylinder, N = the number of cylinders, L the length of the stroke and S the speed of the piston at the highest efficiency.

## Tincher Car No Longer Made

Editor THE AUTOMOBILE:—I am interested in the Tincher car and would like to know if they are still made.

Sheffield, Mass. GEORGE BRIGGS.

—THE AUTOMOBILE has no record of the Tincher car after 1910. Perhaps some of our readers can give you further information.

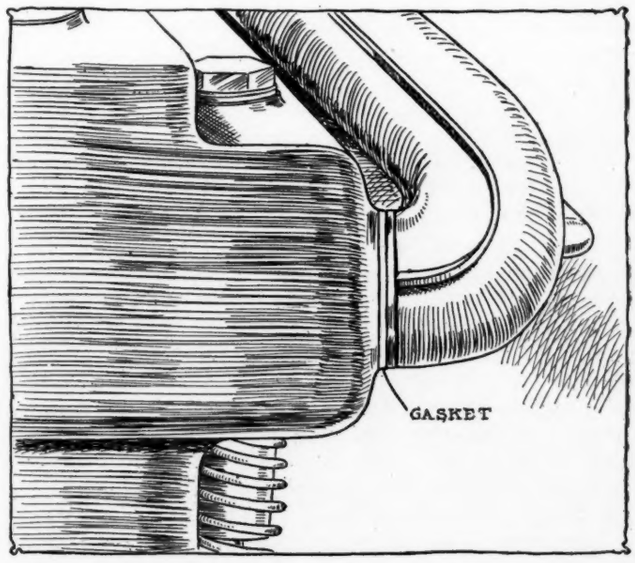


Fig. 9—Finished gasket in place at juncture of exhaust manifold and cylinder

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# Saving the Seconds

THE proverbial "Save the pennies and the dollars will take care of themselves" should be rewritten for the owner of motor commercial vehicles as "Save the minutes and the hours will take care of themselves."

The minutes must be saved in motor truck operation and if the systems under which the vehicles are operating take recognition of the minutes it is a positive assurance that hours per week will be added to the length of time the truck is moving. The very fact that the transportation engineer has looked after the economy of minutes in loading and unloading the truck; the very fact that the minutes have been taken into consideration in the design of the body with a view to lessening delays; the very fact that minutes have been a prime consideration in the design of the loading or unloading platforms; the very fact that time has been a basic consideration in the drafting of the internal system of the factory, warehouse or mercantile establishment; and the fact that minutes have not been overlooked in manning the truck are all *prima facie* evidences that the transportation engineer has grasped the big problem in individual transportation and is an assurance that the truck will not be standing idle 30 or 45 per cent. of its time and, in the words of the horseman, "eating its head off in the stable, when rents are high and provender is dear." The truck destroys its usefulness when it is standing idle at the loading or unloading platform.

The show which closed last week at the Chicago Coliseum demonstrated that the buyer of today is as much interested in the type of body he is going to fit to his truck as in a great many chassis details. In a word, some of the newest truck body creations are features, carefully planned and worked out, combining not a few details indispensable to the particular industry in which the truck must operate. Thus, for example, although there may be fifty different coal operating concerns in New York City, yet these fifty cannot use the one design of dumping coal body but may require ten to twenty different designs, according to the conditions each operator has to meet. One concern loads from overhead hoppers and calls for a particular type of dump body which may be low and wide; another concern with cross-sidewalk deliveries must utilize an elevating dump body; then again, a Chicago house making deliveries into alleys finds it impossible to use the rear end dump and has to introduce the revolving dump body which permits of turning the body through an angle of 90 degrees and then dumping it to the side; still another operator in the Windy City discovers that he cannot load from overhead hoppers but must shovel the coal into the wagon and to make a truck efficient under such an exigency he has to have some form of demountable body, perhaps made in one or two detachable parts, so that the only loss of time experienced is that consumed while removing or replacing the demountable compartments; a third coal operator requires a compartment body which is not demountable, but one containing 3, 5 or 7 tons with a similar number of compartments and each compartment fitted with its individual unloading means to economize in time; and a score or more of similar examples could be cited to show the necessity for versatility in body design, a versatility made imperative by the varying conditions to be met by the many concerns. The fact that operator No. 1 uses a rear dump body is not the slightest reason why operator No. 2 should use a similar type simply because he does business in the same city and in a contiguous territory. If truck operators are going to economize time by loading and unloading means adapted to their respective businesses then they must design bodies to meet their special requirements. The transportation engineer is the man to determine the body requirements and his investigation must be thorough and not based on mere hearsay. The ultimate success of the motor truck installation is largely dependent on the features of body design and the reconciling of terminal facilities to these requirements.

The motor truck buyer must keep before him always the body situation and must be conscious of the fact that the selection of what he considers a satisfactory chassis is but a part of the problem he has to handle. He must not imagine that because he has used a certain design of body on his horse vehicles that these have simply to be duplicated for his motor vehicles. Such a course may be motor transportation suicide. The motor truck is a new order of things, demanding new methods, new constructions and scientific conduct of loading and unloading operations. The transportation engineer must realize that mere substitution of motor power for horse equipment is not enough and more than mere experience could be considered a satisfactory reference for an applicant for an important position.

# Present Location of American Freight Cars

## Report of the American Railway Association Shows There Are 2,308,700 Cars in the Country

### There Is a Shortage of 825 Cars in the Group of Greatest Automobile Producing States

IN view of the great annoyance to which the automobile industry was put during the last shipping season on account of the great shortage in the West of freight cars which could handle the business of delivering automobiles, the present situation is of interest.

The American Railway Association has just compiled its report showing the present location of the freight cars throughout the United States. This report is condensed in the table given below. From this tabulation it is possible to note the condition of shipping facilities throughout America.

An explanation of the table may be of value in order that the reader may readily follow the status of freight car affairs as applied to the automobile industry:

NUMBER OF ROADS REPORTING—This column refers to the number of railroad lines which have sent data to the association for the compilation of the table. It includes every line of importance in the country.

TOTAL CARS OWNED—The total number of freight cars owned by the lines reporting.

HOME CARS ON HOME ROADS—The number of cars out of the total cars owned given above, which are on the lines of the roads reporting in that particular district.

FOREIGN CARS ON HOME ROADS—The total number of cars of other lines which are at present on the territories of the home cars.

TOTAL CARS ON LINE—The summation of the home cars on the home roads and the foreign cars on the home roads.

EXCESS OR DEFICIENCY—The excess is given in light type and the deficiency in heavy type. The excess cars are those standing idle. These are the cars in excess of those required and for which there is no use. The deficiency is the number of cars required above the number available for business of any kind.

SURPLUS—The number of cars of special types above those required for the specific purposes for which the cars were designed.

SHORTAGE—The number of cars of a special type below those required for the specific purposes for which the cars were designed.

HOME CARS IN HOME SHOPS—The number of freight cars being repaired in shops of the line by which they are owned.

FOREIGN CARS IN HOME SHOPS—Cars repaired belonging to outside lines.

TOTAL CARS IN SHOP—A summation of foreign and home cars in the shops.

PER CENT. TO TOTAL CARS OWNED—Under this general head the foregoing quantities are reduced to a percentage basis.

Group 3, comprising Ohio, Indiana and Michigan and group 6, including Iowa, Illinois, Wisconsin and Minnesota, are of special interest to the automobile industry. It will be seen that group 3, which includes Michigan and Indiana, the greatest of the automobile shipping states, suffers from a shortage at the present time of 825 cars. This, while not promising in view of the fact that the trend of the cars is away from Michigan at present, is not so bad as last year. Group 6 has an excess of over 17,000.

## Middle West Has Prosperous Year

ST LOUIS, MO., Feb. 12—According to a monthly statement issued by the Merchants-Laclede National Bank, of this city, Tuesday, February 11, thousands of the farmers in the territory tributary to this city have become the owners of automobiles as a result of the profits coming to them from their recently marketed crops. What is more to the point the report shows that the farmers who have purchased cars have been able to pay for them.

This situation is contrasted in the report with that prevailing a few years back, when farmers from the same community were compelled to borrow money to buy their cars. "The machines which they have purchased recently," the report says, "are not expensive makes, but they represent excellent investments."

**FREIGHT CAR REPORT OF THE AMERICAN RAILWAY ASSOCIATION**

| GROUPS | Number of Roads Reporting | Total Cars Owned | Home Cars on Home Roads | Home Cars on Foreign Roads | Foreign Cars on Home Roads | Total Cars on Line | *Excess or Deficiency | Surplus | Shortage | SHOP CARS | | | PERCENT TO TOTAL CARS OWNED | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Home Cars in Home Shops | Foreign Cars in Home Shops | Total Cars in Shop | Home Cars on Home Roads | Total Cars on Line | Home Cars in Home Shops | Foreign Cars in Home Shops | Total Cars in Shops |
| 1 New England | 8 | 86,124 | 39,251 | 46,873 | 61,354 | 100,605 | 14,481 | 992 | 714 | 5,178 | 1,699 | 6,877 | 45.57 | 114.32 | 6.01 | 1.46 | 7.47 |
| 2 N. Y., N. J., Del., Md., Eastern Pa. | 58 | 675,791 | 340,368 | 335,423 | 315,420 | 655,788 | **20,003** | 5,648 | 2,088 | 30,571 | 8,905 | 39,476 | 50.37 | 97.04 | 4.52 | 1.32 | 5.84 |
| 3 Ohio, Ind., Mich., Western Pa. | 46 | 284,380 | 83,510 | 200,870 | 200,045 | 283,555 | **825** | 3,112 | 1,479 | 11,937 | 8,824 | 20,761 | 29.37 | 99.63 | 4.55 | 3.37 | 7.92 |
| 4 Va., W. Va., No. and So. Carolina | 28 | 196,980 | 96,307 | 100,673 | 86,625 | 182,932 | **14,048** | 6,818 | 1,801 | 8,575 | 1,930 | 10,505 | 48.89 | 92.87 | 4.35 | .98 | 5.33 |
| 5 Ky., Tenn., Miss., Ala., Ga., Fla. | 51 | 170,644 | 68,376 | 102,268 | 85,241 | 153,617 | **17,027** | 1,577 | 5,058 | 9,310 | 2,578 | 11,888 | 40.07 | 90.02 | 5.46 | 1.51 | 6,97 |
| 6 Iowa, Ill., Wis., Minn. | 56 | 456,977 | 276,645 | 180,332 | 197,576 | 474,221 | 17,244 | 5,707 | 7,039 | 18,996 | 5,909 | 24,905 | 60.54 | 103.77 | 4.39 | 1.37 | 5.76 |
| 7 Mont., Wyo., Neb., Dakotas | 10 | 16,506 | 3,442 | 13,064 | 11,857 | 15,299 | **1,207** | 780 | 559 | 439 | 740 | 1,179 | 20.85 | 92.69 | 2.66 | 4.48 | 7.14 |
| 8 Kans., Colo., Okla., Mo., Ark. | 29 | 150,154 | 64,277 | 85,877 | 85,129 | 149,406 | **748** | 5,610 | 793 | 7,696 | 2,492 | 10,188 | 42.81 | 97.34 | 5.13 | 1.56 | 6.69 |
| 9 Tex., La., New Mex. | 28 | 29,362 | 11,804 | 17,558 | 31,364 | 43,168 | 13,806 | 4,072 | 80 | 1,413 | 1,261 | 2,674 | 40.20 | 147.02 | 4.81 | 4.30 | 9.11 |
| 10 Ore., Idaho, Nev., Cal., Arizona | 33 | 127,057 | 61,538 | 65,519 | 69,771 | 131,309 | 4,252 | 17,691 | 1,115 | 3,915 | 2,370 | 6,285 | 48.43 | 103.35 | 3.08 | 1.87 | 4.95 |
| 11 Canadian Lines | 4 | 114,725 | 75,128 | 39,597 | 57,303 | 132,431 | 17,706 | 2,653 | 4,162 | 3,751 | 582 | 4,333 | 65.49 | 115.43 | 3.27 | .51 | 3.78 |
| **Grand Total** | 351 | 2,308,700 | 1,120,646 | 1,188,054 | 1,201,685 | 2,322,331 | 13,631 | 54,660 | 24,888 | 101,781 | 37,290 | 139,071 | 48.54 | 100.59 | 4.50 | 1.65 | 6.15 |

*Deficiency in heavy faced type.

# Stroke-Bore Ratio Affects Efficiency

## Defining the Term Long-Stroke—High Rotative and Reciprocating Speeds Prohibitive for Practical Reasons—Foreign Engineers Discuss Problem

*From Paper Read before the S. A. E. by John H. Wilkinson*

IN the earlier days of the automobile industry the ratio of the stroke to bore of a gasoline engine was not a much argued question. Engines of equal stroke and bore were quite common, as well as engines with longer strokes; among the latter, as I remember it, the 4 1-4-inch by 5 1-4-inch engine was very common. Later the square motor became well-nigh universal both in this country and abroad.

It was at this time that the horsepower formula

$$\text{Horsepower} = \frac{D^2N}{2.5}$$

came into general use, being adopted first by the Royal Automobile Club of Great Britain and later by the Mechanical Branch of the Association of Licensed Automobile Manufacturers. **This formula was meant only as a working one relative to the almost universal practice of equal bore and stroke.** As such it served its purpose well, but today is out-of-date because the practice has changed somewhat. Three or 4 years ago the so-called long-stroke motor began to come into use abroad. Its use in England was first stimulated by a 4-inch race in 1908, in which the size of the engine was limited to a 4-inch bore, stroke not being limited. As the power of a motor can be increased by increasing its size in the direction of stroke as well as bore, this naturally led to the building of motors with strokes of more or less extreme length.

### Bore Affects English Tax

Another strong incentive for small-bore long-stroke engines is the English annual inland revenue tax based on horsepower by the formula. This tax is pretty high as can be seen by the following table:

| | £ | s | | | £ | s |
|---|---|---|---|---|---|---|
| 6½ horsepower..... | 2 | 2 | 33 horsepower..... | | 8 | 8 |
| 12 " ..... | 3 | 3 | 40 " ..... | | 10 | 10 |
| 16 " ..... | 4 | 4 | 60 " ..... | | 21 | |
| Exceeding | 60 | | " ..... | | 42 | |

Still another incentive is that the power classifications for speed and hill-climbing contests all favor the long-stroke motor.

In this country our speed contests are based as far as power is concerned on the volumetric displacement, a classification which I hope to show to be correct scientificially and practically. We have, then, in this country, no good reason for the adoption of any stroke-bore ratio other than that which can be shown to best meet our conditions. It is manifestly improper to classify all motors of even stroke and bore as short-stroke and all others as long-stroke.

If we take as the limits the ratios 1 and 2 and divide these into three classes we will have:

| | | |
|---|---|---|
| Short stroke..... | 1. to 1.33 | ratio |
| Medium stroke..... | 1.33 to 1.66 | " |
| Long stroke..... | 1.66 to 2 | " |

This would be a reasonable classification for the sake of definition. Most American motors are in the first or short-stroke class.

Theory teaches us that rotative and piston speeds are limited ultimately by the strength of materials. Practice has taught us that with our present knowledge they are limited by other conditions also, such as lubrication, piston cooling and valve cooling; and that these limits are well within those set by the strength of materials.

To illustrate this point select a 4-inch bore by 5-inch stroke engine and take the explosion pressure at 325 pounds. The total pressure on the piston connecting-rod and bearings will then be 4082 pounds. It is a fair assumption that the connecting-rod must necessarily be strong enough to withstand this load. Now to find the revolutions such that the inertia of the piston equals 4082 pounds we resort to the formula

$$F = .00017\ W\ N^2\ S$$

where $F$ = Stress set up by piston
$W$ = weight of piston = 3 pounds
$N$ = R.P.M.

$$S = \text{Stroke in feet} = \frac{5}{12}$$

Reducing we have

$$N = 4500 \text{ R.P.M.}$$

I think that no one will contend that 4500 revolutions per minute would be a practical rotative speed for a 4-inch by 5-inch engine.

In this country today the practical maximum number of revolutions varies perhaps from about 1600 to 2000 according to the size of engine. For commercial car uses the tendency in maximum revolutions per minute seems to be still more conservative.

Before studying the question in preparation for this paper it had always been the belief of the writer that the long-stroke motor could not properly be run at as high a rotative speed as the short-stroke motor. This, I think has been the general opinion and was the view of the horsepower formula committee mentioned later. However, I have not been able to find any scientific or practical reasons supporting this view and **will attempt to explain later the reasons which seem conclusive to me why long-stroke motors may be run as fast rotatively as short-stroke motors of equal displacement.**

### Committee Made Extensive Tests

As relating to this question I show some of the curves and tables of the horsepower formula committee representing the Institute of Automobile Engineers, the Royal Automobile Club and the Society of Motor Manufacturers and Traders. This was a very formidable committee, but its conclusions have been very severely criticised in many quarters. It made tests of 144 engines, 101 of which tests contain all the data required for comparing the effect of stroke-bore ratio in piston speed for values of R or ratio from 1 to 1.61.

CHANGE OF PISTON SPEED WITH VARIATION OF STROKE BORE RATIO R=S/D HIGHEST RECORDED B.H.P.

| Number of tests | Stroke bore ratio | Piston speed at max. B.H.P. |
|---|---|---|
| 15 | 1.00 to 1.08 | 1,303 ft. per min. |
| 30 | 1.10 to 1.20 | 1,240 " " " |
| 24 | 1.21 to 1.30 | 1,385 " " " |
| 25 | 1.33 to 1.44 | 1,414 " " " |
| 7 | 1.50 to 1.61 | 1,597 " " " |

101 engine tests

The formula deduced by the committee is:

$$\text{Piston speed } \sigma = 600\ (r + 1)$$

Such widely varying results do not seem to me to be an

accurate basis of arriving at the proper comparative piston speeds of engine. No attempt was made to show that the conclusion is scientifically or reasonably correct. This is like trying to prove a scientific fact by popular vote. There must be some accurate way of making a proper comparison of piston speeds inasmuch as there are no unknown elements to be considered.

In order to discuss more clearly this and other questions pertaining to the paper, let us compare two engines of equal displacement but of varying stroke-bore ratios. I have selected a

4.5 x 4.5-inch stroke-bore ratio 1
and 3.57 x 7.14-inch stroke-bore ratio 2

Let us assume an equal rotary speed for both, and compare them as to vibration, noise, power, life, control, weight, cost and cooling. The engines, having the same displacement, are practically the same weight. The crankshafts, bearings, etc., can undoubtedly be made of correct size and strength; therefore, unless we find a wide divergence in the forces set up by inertia of the moving parts, we will not find a strong reason why one engine can be run faster rotatively than the other.

Vibration in a four-cylinder engine is caused by varying torque noticeable almost entirely at low speeds, lack of running balance of rotating parts, the effects of which increase rapidly with the speed and which are on the average a very noticeable form of vibration, the unbalanced inertia of the pistons due to angularity of the connecting-rods, and other vibrations due to lack of rigidity in crankshaft, etc.

**The vibration due to angularity of the connecting-rods is the only one having a special relation to piston speed, and in high-class engines is the one most apparent. As it increases according to the square of the speed, it is most noticeable at high speed.**

$F = .00017\ N^2WS$ — represents the force set up by inertia in each cylinder; as N is equal in both engines, the comparative vibration due to above-mentioned cause will be proportional to WS or the stroke × the weight of the piston, the piston pin and the upper half of the connecting-rod. So the engine in which WS is the smallest quantity will have the least vibration. Proper comparison of weights involves similar designs and purposes. In our practice we use pistons as follows:

4½ inches = 5.00 pounds
3⅝ inches = 2.625 "
3⅜ inches = 2.375 "

From these figures it would evidently be fair to take a 3.54-inch piston as weighing 2.5 pounds. **Theoretically pistons should weigh according to the cube of the bore and would do so if made of steel and machined inside and out.** Practically, using cast-iron pistons, the larger would be a little lighter than the proportional figures.

### Piston Speed a Big Factor

The cubes of the bore of these two engines are to each other as 48.8 to 100; the practical weights, 2.5 pounds and 5 pounds are to each other as 50 to 100. It therefore seems that 2.5 and 5 must be substantially correct proportional weights. Our 4 1-2 x 4 1-2 rods 9 inches long weigh on the piston-pin end 1.25 pounds. A similar 3.57 x 7.14 rod 14 inches long should weigh on same end 1.5 pounds; therefore

$W = 5 + 1.25 = 6.25$
$W' = 2.5 + 1.5 = 4$
$WS = 6.25 \times 4.5 = 28.12$
$W'S' = 4 \times 7.14 = 28.56$

**These figures are so near alike that we must assume the vibration in the two motors to be practically the same and that there is no basis for the belief that a long-stroke engine is a slow-speed engine on this account.**

Now is there any reason to be found why the long-stroke engine canot be run as fast as the short-stroke? About the only other point to be considered in this connection is the friction between the piston and the cylinder. This is a function of the pressure and the stroke × the coefficient of friction, which gives the same result in both. We have then two mechanical machines in which the inertia of the moving parts sets up strains and vibrations of the same intensity and duration and which are resisted and absorbed by structures of equal weight and strength and in which the friction caused by such movement is the same.

The question of relative proper speeds is very important in connection with a proper discussion of the question. If it were conceded that of necessity either style of engine is essentially a slow-speed engine and could not be run so fast as the other, this in itself would show immediately an advantage of the one of higher speed capabilities; it would not show in any way that the high-speed motor was not just as good at low-speed work.

If we take the ordinary view of the question that the long-stroke engine must of necessity run more slowly, then to demonstrate its superiority it must first be shown that the slower speed is more desirable and next that at equal speeds it is a better engine. Further, unless it be conceded that the long-stroke motor has equal rotative speed capacity, it follows certainly that lighter, cheaper and more powerful cars can be built with the short-stroke motor.

In regard to noise, which is today perhaps the most important question relating to an engine, we note that both engines have the same rotative speed and the same displacement; therefore they must have the same size and lift of valves and cams. **So the only point of difference relating to noise will be the greater weight of the moving parts of the valve mechanism in the long-stroke engine, due to the greater distance from the valve-seat to cam; the difference is unavoidable, though small, and might amount to 10 per cent.**

The question of power speeds being shown to be equal depends on the thermal and mechanical efficiency and the thermal efficiency depends on the compression and wall surface exposed to heat of combustion.

### Wall Area Is Important

The formula recommended for M.E.P. is $\eta p = 130\ (1 - 1.18/d)$.

It will be noted that the committee admits that the figures supply no evidence of increase of mean pressure with bore, but draws its conclusion from the fact that this is apparent on different engines of the same make and that it is a well-known fact that gases in large vessels lose their heat more slowly than when in smaller ones. The first deduction is open to all kinds of criticism and is admitted by the committee itself to be inaccurate. The second deduction is entirely wrong in application because the bore is not a measure of the volume any more than the stroke. **The real measure of the loss of heat is the ratio of the wall surface to the volume.** The committee might reasonably have said that the greater the displacement of the engine, the higher the M.E.P., compression being the same. To go as far as the committee did, and rate M.E.P. from 68.5 pounds per square inch in a 2.5-inch cylinder, to 99 pounds in a 5-inch, seems to be justified by neither theory nor the facts.

Further, to deduce the effects of wall surface on M.E.P. from results taken at or near maximum brake horsepower, which of necessity was at high rotative speeds, where the sizes of valves, piping and carbureters are by far the principal elements in such M.E.P., indicates a lamentable lack of perception of the problem involved.

In order if possible to get a more rational, practical view of this point, with the good aid of Coker F. Clarkson, I have collected all the data of horsepower curves of our American engines that I could get. I am pleased to say that very few refused this information.

In order to eliminate as many factors as possible and to

get as nearly as possible the true capabilities of the engine, the M.E.P. was taken at 800 revolutions per minute, which represented in every instance practically the maximum M.E.P. at any part of the curve. At this speed the effect of valve piping and carbureter sizes is largely eliminated. Of course, the effect of time of valve setting is present in the results and very likely is mainly responsible for the variations. It will be noted, however, that the results are all within a very reasonable percentage of each other and close to what might be expected. No difference traceable to the size, stroke-bore ratio or internal surface as represented by the valve-in-head or T-head engine can reasonably be deduced.

Two figures are given, one for the bare results, the other with the size of the engine and the style of the head. Knight engines are classed as valve-in-head; T.H. = T-head, L.H. = L-head, V.H. = valve-in-head engine.

| Size of engine | Style of head | Compression, % clearance to total volume | M. E. P. |
|---|---|---|---|
| 4.75 x 5.5 | V.H. | 17 | 111 |
| 4.87 x 6 | T.H. | 21.2 | 100.5 |
| 5.5 x 5.5 | T.H. | 21.2 | 99.5 |
| 4.25 x 5.25 | V.H. | 22 | 90 |
| 4.25x 5 | V.H. | 22 | 90 |
| 5.75 x 5.75 | T.H. | 21.9 | 89 |
| 4.25 x 4.5 | V.H. | 22.4 | 95 |
| 4 x 5.94 | | 23 | 101 |
| 5.37 x 6 | T.H. | 22.7 | 93 |
| 4.25 x 5 | L.H. | 23 | 93 |
| 3.75 x 3.75 | V.H. | 23 | 90 |
| 4 x 5.12 | T.H. | 23 | 89 |
| 4.5 x 4.5 | L.H. | 23.5 | 91 |
| 4.5 x 6 | T.H. | 24 | 97 |
| 4.5 x 5 | | 24 | 93 |
| 4.5 x 4.5 | T.H. | 26 | 90 |
| 5 x5.5 | T.H. | 26 | 84 |
| 4 x 4 | V.H. | 27 | 83 |
| 4.25 x 5.5 | L.H. | 29 | 81.5 |
| 4.5 x 5 | L.H. | 24 | 81 |

I quote the following from a paper by L. H. Pomeroy read before the Institution of Automobile Engineers in December last:

"The writer has had two engines under observation during the past few months which only differed in respect to their valve arrangement, one having overhead valves, the other being of the orthodox type. The compression ratios were identical and every precaution was taken to eliminate disturbing factors. The M.E.P. in each case over a speed range from 600 revolutions per minute to 1000 revolutions per minute was substantially the same, about 96 pounds per square inch. The influence of marked changes in valve settings was also negligible."

Let us look a little into the theory of thermodynamic efficiency and see if it will give any light. **The regular losses in the engine are the mechanical friction, the heat loss to the jackets and the heat going out through the exhaust.** The heat lost to the jackets depends on the difference of temperature, the time and the internal surface of the engine exposed to heat. **The larger the engine the greater the volume in relation to internal surface and therefore the less the relative heat loss. Lengthening the stroke of an engine decreases the thermal loss, not because the stroke is lengthened but because the volume is increased.** Any increase in the size of an engine in the direction of either stroke or bore or both will decrease the thermal loss. It therefore follows that in any given engine the less the internal surface the higher the M.E.P., but both theory and practice show this to be a very small amount. Consider the adiabatic expansion curve in two instances, one of which has no internal surface at all and the other an ordinary engine with a jacket loss of 35 per cent. and an exhaust loss of 45 per cent.

## Jacket Loss May Be Calculated

The difference in the mean pressure of these curves is about 15 pounds per square inch. Our practical problem then would be: If the difference between no jacket loss and the ordinary loss is 15 pounds per square inch, what is the difference in the case of two engines of a given difference in internal surface?

Our two engines, considering them as T-head with standard size valves, would have internal surface about as follows:

4.5 inches by 4.5 inches, 80 square inches at beginning, 143.6 at end of stroke.

3.57 inches by 7.14 inches, 71.8 square inches at beginning, 150.8 at end of stroke.

As the heat loss is a function of the difference of temperature and the surface, it is easy to figure that if the 3.57 by 7.14 had a jacket loss of 35 per cent., the 4.5 by 4.5 would have a loss of about 36 per cent. It is therefore doubtful whether there would be any difference in M.E.P.

If we had one of the engines with valves in the head, our comparison would be as follows:

4.5 by 4.5, 80 square inches at beginning, 148.6 at end of stroke.

4.5 by 4.5, 53 square inches at beginning, 121.6 at end of stroke.

Here there is a substantial difference in internal surface and we might expect a loss in one of 35 per cent. and in the other of 50 per cent. in the jacket, which might mean 5 pounds M.E.P. difference.

I have seen some curves indicating the surface exposed and the difference in temperature during the stroke. The initial temperature is taken at 3000 degrees absolute and the terminal at 1600 degrees absolute, and the jacket temperature at 212 degrees and 462 or 674 degrees absolute. In the case of the T-head the engine is losing heat at the end of the stroke 66 per cent. as fast as at beginning, and with the valve-in-the-head engine 80 per cent. as fast. Of course, actually the temperature would drop faster in the T-head motor.

Another very interesting reason why the M.E.P. does not increase with size was brought out by F. W. Lanchester, whom I quote as follows:

## Heat Loss During Compression

**"There are two factors, other things being equal, that control the mean pressure—the compression ratio and the cooling loss.** If we prescribe some definite limiting value to the compression ratio to be employed, then it must immediately be conceded that the larger cylinder will show a higher mean pressure, owing to its cooling losses being relatively less than those of the smaller cylinder. Thus, firstly, in the smaller cylinder the actual compression will be lower, owing to the greater cooling during the compression stroke, and, secondly, the heat losses during the combustion stroke will be greater; and so the expansion curve will fall more rapidly. But, as a matter of fact, there is no definite prescribed compression value; the compression is limited by the question of pre-ignition. If an engine is given too high compression, pre-ignition will occur or short of actual pre-ignition the explosions will become of a detonating character, and the engine will be correspondingly noisy. The compression has then to be reduced. Now the smaller the cylinder the higher the compression ratio permissible, owing to the greater cooling during the compression stroke—in fact, not only may the compression ratio be increased but the actual compression may be higher; for the temperature of the charge at any given compression is actually lower. Consequently the small engine, though sacrificing mean pressure due to its greater cooling loss, will, if properly designed, receive some compensation from the higher compression that may be employed.

It is an interesting fact that over the range of sizes commonly employed in automobile work these two influences in many cases almost exactly cancel out. Thus in the Daimler sleeve-valve engine I have found it just as easy to obtain a given mean pressure in a small cylinder (70 millimeters diameter) as in a large one (124 millimeters diameter). Thus to obtain (at ordinary barometric pressure) mean pressure

as shown by the brake in cylinders of the diameters given, the following compression ratios were employed, the figures representing the total volume in terms of the clearance volume.

| Cylinder diameter in millimeters | Ratio |
|---|---|
| 124 | 4.6 |
| 100 | 5.0 |
| 96 | 5.11 |
| 80 | 5.6 |
| 70 | 6.0 |

The maximum brake horsepower of our two engines figured from the formula of the above-mentioned committee is

| | | | | |
|---|---|---|---|---|
| 4.5 by 4.5 | — | 1800 R.P.M. | 96 M.E.P. | 55 H.P. |
| 3.57 by 7.14 | | 1534 | 86 | 46 |

The deduction from the argument of the writer is that the variation is not worth mentioning. It must be evident that if the figures of the committee are taken that the long-stroke engine is an inferior engine.

**The mechanical friction of our two engines differs only in the friction of the wristpin, the crankpin and the main journals.** The piston friction being a product of the thrust, the stroke and the coefficient of friction, will be the same in the engines, as the thrust is proportional to the area of the piston and of course the area multiplied by the stroke is the same in both cases. Likewise the ring friction will be equal. The other frictions mentioned will be proportional to the area of the piston alone, crankshaft sizes being the same. This friction will a coefficient of .04 will be at 800 revolutions per minute about 1.25 horsepower for the 4.5-inch engine and .75 horsepower for the 3.5-inch engine, a difference of .5 horsepower.

## Larger Piston Hard to Cool

**The heat lost through the jacket is a measure of the size of radiator necessary.** As to the effect of piston size on cooling it is undoubtedly true that the larger the piston the more difficult it is to keep it cool, but the limiting feature of our present high-speed engines, with necessarily large valves, is more likely the size of the exhaust valve. It is probable that a stroke-bore ratio below 1 might soon be reached where the piston would be more difficult to cool than the exhaust valve, but we are not dealing in practice with such stroke-bore ratios. **The tabulated data of American engines show the practice is to use as high compression in large engines as in small ones.** So far as the writer knows there have been no experiments in regard to cooling carried on which would show us the relative effects in large and small engines. The writer has never been satisfied that if this elemnt were taken into strict consideration, small engines would not be found superior to large ones in M. E. P. and horsepower per cubic inch of displacement.

The life of an engine is governed largely by its speed. Either type will show superiority in this respect at lower speed. **At equal speed there are to be noted two differences which must be considered in the design. The piston of the long-stroke engine, being shorter and yet subject to the same total friction, will necessarily wear faster. Likewise the bearings of the short-stroke engine, being subject to greater pressure at the same speed, will require more area. The friction and wear of valve mechanism cannot vary, as they should be the same in every respect.**

It might be interesting to note here that any increase of weight due to increasing the life of the piston in one case might possibly be balanced by an increase in the other piston from the desire to get better cooling.

**As a purely thermal question there is apparently no reason why the stroke-bore ratio cannot be carried beyond even a ratio of two.** But as to mechanical design awkwardness begins to be apparent at ratios beyond 1.33; and beyond 1.5 the objections become more or less acute, running into weight and expense without any compensating features. **Any extra long stroke involves too much weight in the valve mechanism and a strong temptation to too short connecting-rods to keep down the height and weight. With L-head engines a design beyond 1.33 exaggerates the valve pocket design. On the other hand, in block engines with two-bearing crankshafts long strokes shorten the distance between bearings and lessen the thrust, thus diminishing the necessary diameter of crankshafts; and in six-cylinder motors the length of motor is shortened.** It might be fair in placing general limits on the stroke-bore ratio to say that it is limited in one direction to 1 by the cooling limit of the piston, and in the other direction to 1.5 by the limits of mechanical adaptiveness.

## Discussion by the Engineers

Professor Marshall, among other remarks, stated that the French engineers had apparently gone to the long-stroke motor and that a bore, stroke ratio of 1.5:1 was below the present average. In the speaker's mind, the main point in connection with horsepower was engine's speed and bore.

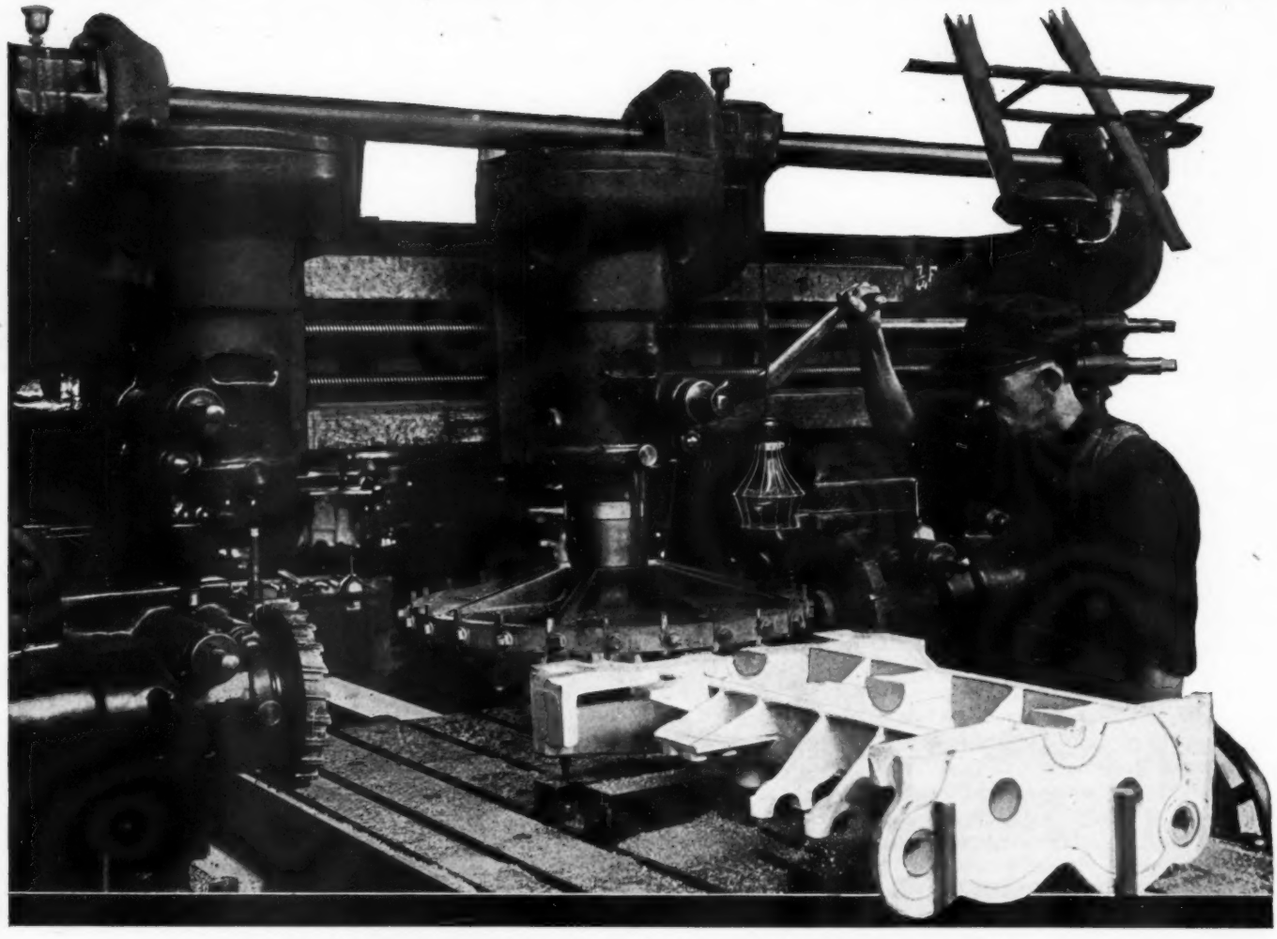
Professor Carpenter stated that there were certain relations to bore that were not considered. Increased speed gave more horsepower, but with engines of the same size and at the same revolutions per minute there was a falling off in the torque curve. **He also pointed out that the formulæ at present employed, namely, $\frac{D^2 N}{2.5}$ when changed and the divisor altered to 2 instead of 2.5 a better approximation of the horsepower was obtained for square engines. In the case of engines having a greater stroke than bore, he considered that by substituting the factor $D^2$ by D X L, L standing for the stroke. In the case of the engine having a longer stroke than bore he thought that instead of squaring the bore that it would be better to multiply the bore by the stroke.**

Chairman Alden stated that there were two schools of engineers in England, and during a recent visit abroad he was present at a meeting of the Institute of Automobile Engineers when a paper was read by Professor Watson, who had made some exhaustive tests upon a single-cylinder Daimler engine. It was admitted by everyone present at the meeting that these tests were more complete than any heretofore made, and theoretically they were excellent, but owing to the fact that the motor chosen was out of date, being 4 years old and badly worn, the test was not of much practical value. Mr. Lanchester, the engineer of the Daimler company, England, took part in the discussion and showed that the shape of the combustion chamber on present day engines had no particular bearing upon the horsepower curve.

Howard Coffin remarked that he did not think that foreign engineers could show the American engineer much; that conditions in England and France were peculiar. There was not the spirit of co-operation abroad and he thought that the work that was being carried on here was just as much to be depended upon as abroad. Mr. Coffin was of the opinion that the short-stroke motor could give more horsepower per pound of weight than the long-stroke motor.

Mr. Riker stated that he had studied the question of the tendency toward long-stroke motors in Europe and found that the crux of the problem was not one of design so much as compulsion. The horsepower of the engines in Europe form the basis for taxation, which was very heavy, and in order to give the buying public as much horsepower for a given bore as possible, thereby avoiding excessive taxation, the stroke had been unduly lengthened. Conditions in this country were entirely different. The buying public here demanded a car that it was possible to drive most of the time on high gear; also that vibration was most detrimental from a selling point; absence of vibration and high-gear driving could not be obtained satisfactorily in the long-stroke motor. Further the buying public in this country prefers six-cylinders.

# Factory Miscellany



Ingersoll crankcase milling machine used by the Haynes Automobile Company, Kokomo, Ind.

WHEREVER it is possible to do two or more things at the same time money is being saved. In this age of economy a tool which can do this, and do it as well as another tool which operates on single jobs, is of the highest interest. The above photograph shows a milling machine which faces three sides of the Haynes crankcases at one time. One workman alone takes care of the machine and sends the work through. After this machine is through with a piece of work the latter is entirely finished and can go directly to the assembling room. When the three sides are done simultaneously in this manner, alignment is a simple problem and cause no further trouble.

**EIGHT Plants for Queens**—The Borough of Queens, N. Y., is to have eight new plants, which will affect the automobile trade in general. The factories planned and under way will employ about 20,000 hands. A list of these plants is as follows: Pierce-Arrow Automobile Company, Buffalo, N. Y., is erecting a four-story building on Freeman street, 200 feet by 205 feet, with extension 51 feet by 54 feet, the estimated cost is $300,000; the Goodyear Tire & Rubber Company, Akron, O., is to erect a building six stories high on Jackson avenue and Honeywell street, to cover 93,000 square feet of ground and to cost $250,000; the General Vehicle Company, Long Island City, N. Y., is building a $350,000 addition to its plant; it is now employing 550 men and will double the number when new plant is ready; the Simplex Motor Car Company, New York City, is to build a factory on Vernon avenue; the Edwards Motor Car Company, Long Island City, N. Y., has purchased a site and is preparing to build a large plant on Berden avenue just east of Dutch Kills Creek; the Ford Motor Company, Detroit, Mich., is to add five stories to its three-story plant on Jackson avenue which will cost $50,000; the American Locomotive Company, Providence, R. I., will double the size of its present plant on Jackson avenue by adding a second story to the building costing $40,000, and the Packard Motor Car Company, Detroit, Mich., is preparing to enlarge its big building on Thomson avenue; plans are not yet filed, but it is stated that two stories are to be added.

**Mayer Carbureter Builds**—The Mayer Carbureter Company, Buffalo, N. Y., is planning the erection of a factory in Detroit, Mich.

**New Atlanta Tire Factory**—The Interstate Automobile Tire & Rubber Company, Atlanta, Ga., is to erect in the near future a factory to manufacture its products.

**Kentucky's Cincinnati Factory**—Ground was recently broken in Cincinnati, O., by the Kentucky Motors Company, which is to erect a plant on that property.

**Wolverine Supply Adds**—The Wolverine Motor Supply Company, Detroit, Mich., has had plans prepared for the construction of a two-story, 74 feet by 84 feet brick addition to its plant.

**Canadian Plant for Goodrich**—The B. F. Goodrich Company, Akron, O., manufacturer of rubber tires, will build a factory at St. Catherines, Ont., to employ about 1,000 men. The town has given the company 17 acres of land and fixed the assessment at $10,000 for 10 years.


### Shows, Conventions, Etc.

Feb. 15-22.....Albany, N. Y., Annual Show, State Armory, Dealers' Association.
Feb. 15-22.....Newark, N. J., Annual Automobile Show, First Regiment Armory, New Jersey Automobile Exhibition Company.
Feb. 16-23.....Richmond, Va., Annual Show.
Feb. 17-22.....Kansas City, Kan., Annual Automobile Show.
Feb. 18-19.....Madison, Wis., Annual Show, City Market Building, Dealers' Association.
Feb. 18-21.....Grand Forks, N. D., Annual Show, Auditorium, Dealers' Association.
Feb. 18-22.....Baltimore, Md., Annual Show, B. A. D. A.
Feb. 19-22.....Bloomington, Ill., Annual Show, Coliseum, McLean County Automobile Club.
Feb. 19-22.....Geneva, N. Y., Automobile Show, Armory, Louis Blumenstein.
Feb. 19-22.....Kalamazoo, Mich., Annual Show.
Feb. 19-23.....New Orleans, La., Annual Show.
Feb. 19-27.....Topeka, Kan., Annual Show.
Feb. 20-22.....Canandaigua, N. Y., Automobile Show, Louis Blumenstein.
Feb. 22-Mar. 1.....Brooklyn, N. Y., Annual Show, 23rd Regiment Armory.
Feb. 24-27.....Kansas City, Mo., Truck Show.
Feb. 24-Mar. 1.....St. Louis, Mo., Annual Show.
Feb. 24-Mar. 1.....Memphis, Tenn., Annual Show.
Feb. 24-Mar. 1.....Omaha, Neb., Annual Automobile Show.
Feb. 24-Mar. 1.....Paterson, N. J., Annual Show, Paterson Automobile Trade Association.
Feb. 24-Mar. 5.....Cincinnati, O., Annual Show, Music Hall, Cincinnati Automobile Dealers' Association.
Feb. 25-28.....Eau Claire, Wis., Annual Show, Armory, Dealers' Association.
Feb. 25-Mar. 1.....Syracuse, N. Y., Annual Show, Syracuse A. D. A.
Feb. 26-Mar. 1.....Fort Dodge, Ia., Annual Show.
Feb. 26-Mar. 1.....Glens Falls, N. Y., Automobile Show, Louis Blumenstein, Manager.
Feb. 27-Mar. 1.....Toronto, Ont., Annual Show, Toronto Automobile Trade Association.
March 3-8.....Bridgeport, Conn., Show, Park City Rink, B. B. Steiber.
March 3-8.....Denver, Col., Annual Show, Municipal Auditorium.
March 3-8.....Springfield, Mass., Automobile Show, New Auditorium Building, United Amusement Company.
March 3-18.....Des Moines, Ia., Annual Show, Pleasure Car Section, Coliseum, Dealers' Association.
March 5-8.....Tiffin, O., Annual Show, Tiffin *Daily Advertiser*.
March 5-8.....Louisville, Ky., Annual Show, Dealers' Association.
March 5-8.....London, Ont., Annual Show, Drill Hall, Louis Blumenstein.
March 8-15.....Boston, Mass., Annual Automobile Show.
March 8-15.....Columbus, O., Annual Show, Billy Sunday Tabernacle, Automobile Club and Traders' Association.
March 11-15.....Buffalo, N. Y., Commercial Vehicle Show, Auditorium, Automobile Dealers' Association.
March 12-15.....Ogdensburg, N. Y., Automobile Show, Louis Blumenstein, Manager.
March 19-26.....Boston, Mass., Annual Truck Show.
March 20-24.....New Orleans, La., Annual Show, N. O. A. D. A.
March 24-29.....Indianapolis, Ind., Annual Automobile Show.
March.....Nashville, Tenn., Annual Show, Nashville Automobile Dealers' Association.
March.....Pittsburgh, Pa., Annual Automobile Show.
April 1-6.....San Francisco, Cal., Motor Truck Show, Coliseum Hall. *Motor Field.*
April 5-19.....Pittsburgh, Pa., Annual Show, East Liberty Market House, Dealers' Association.

### Race Meets, Runs, Hill Climbs, Etc.

May 30.....Indianapolis, Ind., 500-Mile Race, Speedway.
July 27-28.....Tacoma, Wash., Tacoma Road Races.
Nov. 24.....Savannah, Ga., Vanderbilt Cup Race, Motor Cups Holding Company.
Nov. 26.....Savannah, Ga., Grand Prize Race, Automobile Club of America.

### Foreign

March.....France, Sealed Bonnet, 3000-Mile Run.
March 31.....Montevideo, Uruguay, International Competition of Agricultural Motor Vehicles.
April.....Barcelona, Spain, International Exhibition.
May.....St. Petersburg, Russia, International Automobile Exposition, building of Michael Maneze, Imperial Automobile Club of Russia.

**Bremer-Wilson Moves**—The Bremer-Wilson Manufacturing Company, Chicago, Ill., has moved to 1475 Michigan Boulevard, that city.

**San Antonio Club Opens**—The San Antonio, Tex., Automobile Club had its formal opening on February 1. Dr. Frederick J. Fielding is president.

**Fisk Tire in Winnipeg**—The Fisk Rubber Company, of New York City, opened recently a completely equipped branch house in Winnipeg, Man.

**Improvement in Cuero**—The machine shop for the Texas Motor Car & Supply Company, Cuero, Tex., will be located in the west Main street building.

**McGraw Tire Output Large**—$1,160,000 worth of tires were manufactured and sold by the McGraw Tire & Rubber Company, East Palestine, O., during 1912.

**Overland's Foundry**—A $35,000 foundry, 100 feet by 296 feet, is to be erected on the Spear brick yard site in Toledo, O., by the Willys-Overland Company.

**Frisco's Two Studebakers**—Two Studebaker cars have recently been put in service by Uncle Sam in San Francisco, Cal., in connection with the parcel post.

**Kentucky's Machine Shop**—The Kentucky Motor Car Company, Cincinnati, O., has issued plans for a two-story brick and concrete garage and machine shop, to cost $50,000.

**Detroit Dash Company's Fire**—The plant of the Detroit Auto Dash Company, Detroit, Mich., was recently damaged by fire of unknown origin to the extent of $10,000. The plant, which employed about fifty men, will be shut down about a week as a result of the fire.

**Universal's Addition**—The Universal Motor Truck Company, Detroit, Mich., is preparing plans for an addition to its present factory building. The addition will cost $250,000 and will double the capacity of the plant.

**Pilot Enlarges**—The construction of the addition to the plant of the Pilot Motor Car Company, Richmond, Ind., was commenced recently and ground for the new 120-foot building was broken. The new building will be two stories high.

**Fire at Goodyear Plant**—Fumes of burning rubber greatly hampered the work of the firemen at a blaze which started in the reclaiming department of the Goodyear Tire & Rubber Company, Akron, O. The fire was caused by the explosion of an acid container.

**Penn Plant Sold**—At a bid of only $400 more than the $50,000 mortgage resting on the plant, the real estate of the bankrupt Penn Motor Company, New Castle, Pa., was sold recently at public auction. George Roth and J. M. Jack, of Pittsburgh, Pa., were the purchasers.

**Women in Automobile Plants**—The plant of the Ford Motor Car Company, Detroit, Mich., employs about 100 women in the magneto department, to wrap the coils, tin them, and the like. This department is the only one outside of the office where women are employed.

**New Toledo Lamp Factory**—A new General Electric Company, to be known as the General Electric Miniature Lamp Factory, will be located in Toledo, O., and be in operation by April 1. Automobile headlights and electric lights for all uses on such machines will be made by the new branch. The plant will employ 300 men at the opening.

**Flanders Spending $1,000,000**—Walter Flanders, now the head of the reorganized United States Motor Company, stated recently that the Maxwell Motor Company, Dayton, O., which succeeds it, will spend $1,000,000 annually among the Dayton factories for equipped brass cylinder work, or any kind of drop forging which is used in the automobile business.

Repair room of the Goodyear Tire & Rubber Company, Akron, O.


Benguet road in the Philippine Islands, showing one of the cars used in bus service in this region. There are eight cars on the line

**FRENCH 1912 Automobile Exports**—The following statistics of exports of automobiles from France are taken from an article published in the *Petit* of Havre: The year 1912 showed a decided advance in the automobile exports in comparison with those of 1911. These exports amounted to 230,167 metric quintals (metric quintal equals 220.446 pounds) as compared with 175,591 in 1911. The exports of industrial cars, farming wagons and heavy vans increased from 7,262 quintals in 1911 to 8,158 quintals in 1912. Among the countries of destination of these exports the United Kingdom stands first, having taken 60,765 quintals, as compared with 54,585 in 1911; Belgium follows with 55,799 quintals, as compared with 34,737 in 1911; Algeria with 21,640 as compared with 13,769 in 1911; Germany with 17,699, as compared with 14,624 in 1911; Argentina with 14,937, as compared with 9,265 in 1911, and Brazil with 11,994, as compared with 7,271 in 1911. The imports of automobiles into France, according to the same source of information, increased from 12,819 metric quintals in 1911 to 15,051 in 1912. These figures are all necessarily provisional and no valuation was given.

**Westman with Henderson**—E. E. Westman has taken a position as purchasing agent of the Henderson Motor Car Company, Indianapolis, Ind.

**East Joins Timken**—G. L. East has joined the publicity staff of the Timken Roller Bearing Company, Detroit, Mich., as assistant advertising manager.

**Johns-Manville's Newark Office Moves**—The H. W. Johns-Manville Company, New York City, announces the removal of its Newark, N. J., office to 239 Halsey street.

**Trask with Marmon**—C. A. Trask, formerly with the Henderson Motor Car Company, Indianapolis, Ind., recently joined the Nordyke & Marmon Company, Indianapolis, Ind.

**Des Moines Show Plans**—The Des Moines Automobile Show will be devoted only to the pleasure car end, although a few trucks may be shown. The show is to be held March 3.

**Wants Motor Truck Prices**—The Texas Motorway Company, C. L. Cade, engineer in charge, 511 Sumpter Building, Dallas, Tex., wants prices on motor trucks for passengers and freight.

**Zink's Kerosene Carbureter**—C. S. Zink of St. Louis, Mo., who has perfected an efficient kerosene carbureter, is in Indianapolis, Ind., trying to obtain permission to demonstrate it for various manufacturers.

**McIntyre Building Partially Destroyed**—Fire at Auburn, Ind., recently destroyed a three-story brick building belonging to the W. H. McIntyre Company. The loss on the building and its contents was about $100,000.

**Bryant Resigns from Franklin**—G. H. Bryant has resigned as advertising manager of the Franklin Automobile Company, Syracuse, N. Y. He is succeeded by W. M. Williams, who has been assistant advertising manager.

**Bosch Appoints Two Distributors**—The Bosch Magneto Company, New York City, has appointed the Kansas City Automobile Supply Company, Kansas City, Mo., and the Powell Supply Company, Omaha, Neb., as its distributors for its product.

**Strauss Changes Position**—M. F. Strauss, recently with the American-Marion Sales Company, New York City, has accepted a position with S. P. Townsend & Company, Orange, N. J., taking charge of their drafting department and general engineering work.

**Leases Large Southern Garage**—A. E. Reid, distributor of the Overland car in Louisville, Ky., has closed a lease for 5 years for the Olds Motor Works branch, which was recently abandoned by them and will take possession of the new $110,000 structure in the near future.

**Two Indianapolis Changes**—Two changes in location have taken place in Indianapolis, Ind., the A. & M. Service & Sales Company moving to Capitol avenue and Vermont street, while the Hunter-Hammond Automobile Company has moved into the quarters vacated by the A. & M. concern.

**Burt's Los Angeles Home**—The W. J. Burt Motor Car Company, Los Angeles, Cal., during the past week occupied its new home at Pico and Home streets. The new building is 60 feet by 155 feet and two stories in height, giving 19,000 square feet. W. J. Burt is state agent for the Auburn.

**Automobiles in Yosemite Valley**—Los Angeles automobilists are becoming more enthusiastic daily over the prospects of the wonderful Yosemite Valley being thrown open to automobiles by the Government. A telegram, stating their wants, was sent by the Los Angeles, Cal., Chamber of Commerce to the California Senators and Congressmen.

# New Agencies Established During the Week

## PLEASURE CARS

| Place | Car | Agent |
|---|---|---|
| Amherst, N. S., Canada | Cole | F. A. Wilson |
| Armour, S. D. | Moon | T. W. Fotheringha |
| Avon, S. D. | Cole | J. P. Krall |
| Baltimore, Md. | Cameron | G. H. Wehr |
| Baltimore, Md. | Cole | Cole Sales Co. |
| Baltimore, Md. | Reo | R. H. Croxton |
| Baltimore, Md. | Stoddard-Dayton | Cole Sales Co. |
| Bardstown, Ky. | Cole | Grigsby & Co. |
| Bristol, Tenn. | Cole | Davis Sparger Auto Co. |
| Bucyrus, O. | Hudson | Samuel Hirtz |
| Buffalo, N. Y. | Havers | Barrett M. C. Co. |
| Camilla, Ga. | Cole | L. J. Hay |
| Chattanooga, Tenn. | Cole | Hirsch Bros. |
| Chicago, Ill. | Havers | Metallurgique M. C. Co. |
| Chicago, Ill. | Staver | T. J. Hay |
| Columbus, O. | Empire | E. L. Jacoby |
| Columbus, O. | Great Western | Charles Ross |
| Clarinda, Iowa | Cole | A. V. Hunt |
| Danbury, Conn. | Case | H. A. Hume |
| Davis, S. D. | Moon | William DeNoma |
| Des Moines, Ia. | Regal | Lyen, Christianson & Swanson Auto Co. |
| Easton, Pa. | Cole | LaFayette Motor Car Co. |
| Gladwin, Mich. | R-C-H | F. L. Prindle |
| Greensboro, N. C. | Cole | P. W. Richardson |
| Hartford, Conn. | Hupmobile | Curtis & Prowe |
| Hartford, Conn. | Locomobile | Buick Garage Company |
| Hartford, Conn. | Velie | Goldberg-Gastonguay Coal Co. |
| Howard, S. D. | Moon | S. T. Radcliff |
| Ivanhoe, Minn. | R-C-H | Schulz & Jensen |
| Kankakee, Ill. | R-C-H | O. K. Baldwin |
| Lehighton, Pa. | Cole | Serfas Motor Car Co. |
| Le Mars, Ia. | Cole | Marx & Marx Auto Co. |
| Lena, Ill. | Cole | Inman & Presse |
| Logan, O. | Ford | Cage Automobile Co. |
| Logan, O. | Hudson | Cage Automobile Co. |
| Logan, O. | Overland | Cage Automobile Co. |
| Louisville, Ky. | Premier | Clark M. C. Co. |
| Louisville, Ky. | Velie | E. H. Specht |
| Lyons, Neb. | Cole | Swanson Bros. |
| Madison, S. D. | Moon | C. J. Whitlock |
| McArthur, O. | Ford | M. C. Westfall |
| Middletown, N. Y. | Pullman | F. S. Pulver |
| Minneapolis, Minn. | Michigan | C. O. Jacks |
| Minneapolis, Minn. | Moon | Tri-State Automobile Co. |
| Minneapolis, Minn. | R-C-H | H. S. Haynes |
| Minneapolis, Minn. | Havers | A. F. Chase & Co. |
| Montreal, Que. | CarterCar | Rivet Motor Garage Co. |
| Moville, Ia. | Moon | Southwick & Maxfield |
| New Britain, Conn. | Case | C. A. Dennison |
| New Orleans, La. | Overland | Mobile Overland Auto Co. |
| New York City | Empire | John Moore & Co. |
| New York City | Havers | S. & M. Motor Co. |
| Northfield, Minn. | Cole | Tom C. Mabon |
| Norwalk, O. | Detroiter | J. E. Snable |
| Olympia, Wash. | Ford | W. E. Brensen |
| Oregon, Ill. | Moon | Oregon Auto Supply Co. |
| Ottawa, Ont., Canada | Cole | Pink, McVerty, Blackburn |
| Paris, Tenn. | Moon | E. E. Davis |
| Philadelphia, Pa. | R-C-H | Schumaker & Co. |
| Poplar Bluff, Mo. | Cole | C. Williams & Brothers |
| Princeton, Ill. | Moon | J. M. Ennis |
| Rock Rapids, Ia. | Moon | Rhose Bros. |
| Salem, Ore. | Cole | Chamberlain Bros. |
| San Francisco, Cal. | Chevrolet | Norman De Vaux |
| San Francisco, Cal. | Little | Norman De Vaux |
| Silver Creek, N. Y. | Cole | F. B. Porter |
| Stanford, Me. | Pullman | Ford & Johnson |
| Syracuse, N. Y. | Alco | W. R. Shaw |
| Syracuse, N. Y. | Paige-Detroit | Syracuse M. C. Co. |
| Syracuse, N. Y. | White | Syracuse Garage |
| Tacoma, Wash. | Flanders | Lamping & Garfield |
| Trement, Ill. | Cole | Koch & Tisch |
| Trenton, N. J. | Cole | Trenton Motor Car Co. |
| Wadena, Minn. | Cole | Baehr Brothers |
| Warren, O. | Cole | Morgan & Williams |
| Washington, D. C. | American | Cunningham M. C. Co. |
| Washington, D. C. | Marion | Cunningham M. C. Co. |
| Washington, D. C. | Metz | H. A. Rhine & Co. |
| Washington, D. C. | Nyberg | H. A. Rhine & Co. |
| Wilkes-Barre, Pa. | Pullman | Commercial M. C. Co. |
| Worcester, Mass. | Havers | J. R. Hawks |

## COMMERCIAL VEHICLES

| | | |
|---|---|---|
| Albany, N. Y. | Stewart Delivery | E. V. Stratton Co. |
| Baltimore, Md. | Service | Rittenhouse-Winterson Co. |
| Hartford, Conn. | Chevrolet | Buick Garage Company |
| Boston, Mass. | Mack & Saurer | International Motor Co. |
| Boston, Mass. | Standard | Whitten-Gilmore Co. |
| Boston, Mass. | Westcott | Learned-Kemp Co. |
| Bridgeport, Conn. | Brown | H. B. Gates |
| Bridgeport, Conn. | Standard | J. L. Carpenter |
| Seattle, Wash. | Standard | Pacific Car Co. |

## ELECTRIC VEHICLES

| | | |
|---|---|---|
| Baltimore, Md. | Rauch & Lang | Rittenhouse-Winterson Co. |
| Baltimore, Md. | Standard | Zell Motor Car Co. |
| Montreal, Que. | Baker | Stockwell Motor Car Co. |

**Schaffer, Treasurer Keeton**—H. S. Shaffer has become treasurer of the Keeton Motor Company, Detroit, Mich.

**Syracuse Show Large**—The Syracuse Automobile Dealers' Association will hold its fifth annual exhibition on February 25. There are 166 exhibits listed, with a number of novelty booths.

**Dunwoodie with Maxwell**—David Dunwoodie of Dayton, O., will join the executive force at the head office of the Maxwell Motor Company, Inc., and take charge of the sales of its cars.

**Goodyear's New Building**—The Goodyear Tire & Rubber Company, Toledo, O., branch, is moving into its new building, corner Madison avenue and Fourteenth street. This concern will carry about a $500,000 stock of tires.

**Motometer Opens Chicago Office**—The Motometer Company, Inc., New York City, makers of the Motometer, the new device attached to the radiator cap for indicating to the driver the heat of the motor, has opened a Chicago, Ill., branch at 1322 Michigan avenue.

**Electric Vulcanizer's New Officers**—The Electric Vulcanizer Company, Minneapolis, Minn., has reorganized with new officers. It will sell tires as well as repair them. The officers are as follows: E. M. Thorsteinson, president; J. H. Dupont, secretary, and J. E. Brandon, treasurer.

**Inter-State Club's Officers**—The following officers were recently elected in the Inter-State Boosters Club, an organization in the Inter-State Automobile Company, Muncie, Ind.; C. P. Brockway, president; B. J. Cline, advisory board; C. V. Morse, chairman, and B. D. Vogel, secretary.

**Deadwood's Automobile Show**—An automobile show is to be given in the auditorium March 31, in Deadwood, S. D. The show is the outcome of the formation of the Black Hills Automobile Dealers' Association, attended by twenty dealers of the section, to promote the interests of the trade.

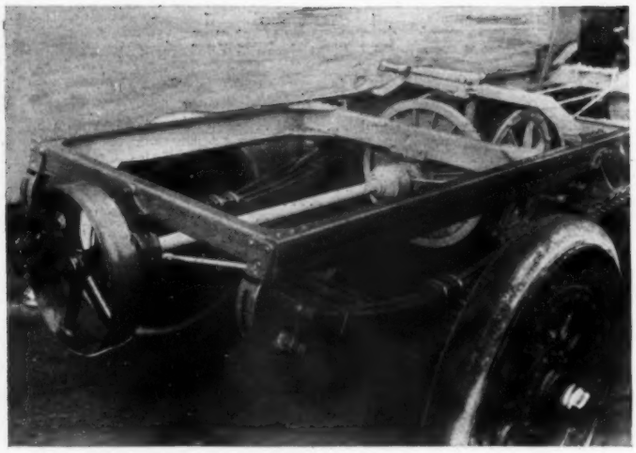
**Bradley Invents Engine**—Dr. A. Bradley of Albert Lea, Minn., has invented a new automobile engine, has tested it and found it to be practical for his use, developing 60 horsepower. The engine, 4-cylinder, 4-cycle, and has only two moving parts, not counting the crankshaft and the pistons.

**Brazil to Improve Roads**—Brazil is to have improved highways. The Empreza Autovairia Paulista has been granted permission by the government to construct a road between Sao Paulo and Santos, Brazil. Reports state that this company has floated a loan for this purpose, netting $650,000.

**Minnesota Dealers' Association Formed**—The Minnesota Retail Automobile Dealers' Association was recently formed in Minneapolis, Minn. It is formed to combat price cutting by distributors and curbstone dealers and to eliminate the latter agent from the market. C. W. Jewett was elected president.

**Long Island Club's Run**—The Long Island Automobile Club will hold an informal run on Washington's birthday, to be counted in the competition for the trophy to be awarded to the member taking part in the most competitions during the season. The run will start from the club house and end at the Brooklyn automobile show.

View of the Rochester, N. Y., automobile show, held at Exposition Park



Rear view of Service truck, shown at Chicago, with its cushion wheels and pulley attachment for driving machinery

**Plumb Sales Manager**—F. W. Plumb has joined the Palmer-Moore Motor Truck Company, Syracuse, N. Y., as sales manager.

**Hall Universal Manager**—H. W. Hall has been appointed manager of the Boston, Mass., branch of the Universal Motor Truck Company.

**Syracuse Club's Banquet**—The Automobile Club of Syracuse, N. Y., is planning its annual banquet for March 6 in the ballroom of the Onondaga.

**Crockett Locomobile Truck Manager**—Frank Crockett has been appointed manager of the truck department of the Locomobile's Boston, Mass., branch.

**Futtermans Control Superior Lamp**—Harry, Myer and Abraham Futterman have taken over the control of the Superior Lamp Manufacturing Company, New York City.

**Sarles Elected President**—The North Dakota division of the Meridian Road Association has re-elected former Governor E. Y. Sarles as president and C. W. Graves as secretary.

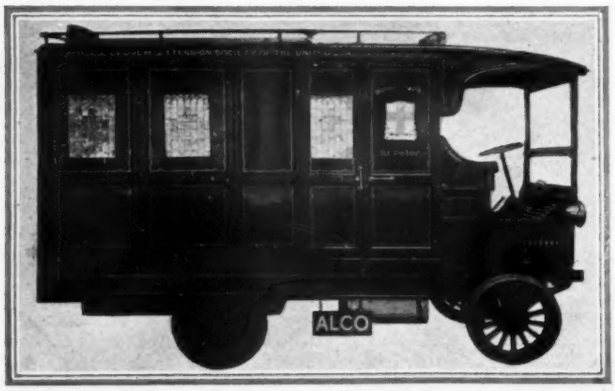
**Dart to Conduct Shows**—F. W. Dart has completed an organization that will conduct shows throughout the country next season. Mr. Dart managed the recent Hartford, Conn., show.

**Lakeside Show in April**—The automobile dealers of the neighboring city of Auburn, N. Y., are planning for their annual show in the pavilion at Lakeside early in April. Details are now being perfected.

**Harrisburg Club Elects**—The Harrisburg Motor Club, Harrisburg, Pa., recently elected the following officers: W. E. Lauver, president; F. H. Bomgardner, vice-president, and J. C. Myton, secretary-treasurer.

**Pope Chemical Wagons Ordered**—Two chemical wagons have been ordered of the Pope Manufacturing Company, Hartford, Conn., by the Worcester, Mass., fire department. This will make three machines of this type in service.

**Bus Line in Lancaster**—W. A. Arnold has purchased an automobile and will operate a bus line from Lancaster, Ky., to Nicholasville, Ky. This makes the second automobile line which has been put into operation between the two cities.




Alco motor chapel built for the Catholic Church Extension Society, showing the chapel closed

**Denison Advertising Manager**—G. H. Denison has assumed the post of advertising manager with the Dyneto Electric Company, the factory being at Elbridge and the business and sales office at No. 200 East Genesee street, Syracuse, N. Y.

**Ithaca Wants Fire Trucks**—A committee headed by City Judge Daniel Crowley has requested the fire commissioners of the city of Ithaca, N. Y., to recommend to the common council of that city the purchase of a combination hose and chemical automobile.

**Lageson's Anti-Skid Cover**—K. J. Lageson, Benson, Minn., has patented an anti-skid cover for vehicle wheels, to prevent skidding. It is to provide a chain tread of novel construction consisting of links shaped to fit the tread of the tire and having integral loop portions on two sides of the links that form projections, engaging the road surface and preventing side slipping.

**Concrete Road Proves Success**—C. E. Gordon, member of American Society of Chemical Engineers and official representative of the war department, recently spent several days at Fond du Lac, Wis., to inspect and investigate concrete street pavement, of which type that city has laid thousands of square yards, being a pioneer in the use of concrete for pavements. He was able to gain valuable information as to the durability of this type of paving, for the reason that some of it has been down for more than three and one-half years.

# Automobile Incorporations

## AUTOMOBILES AND PARTS

ALTOONA, PA.—Keystone Motor Car Company; capital, $10,000; to deal in cars, and to carry on a general automobile garage and repair business. Incorporators: Albert E. Akers, president.

AUGUSTA, ME.—American Automatic Protective Valve Company; capital, $400,000; to manufacture, sell and deal in valves and other devices. Incorporators: R. S. Buzzell, L. J. Coleman.

BROOKVILLE, O.—Brookville Auto Company; capital, $10,000. Incorporators: J. Ward Somers, Edward S. Somers, V. T. Somers.

BUFFALO, N. Y.—Conover Limousine Top Company, Inc.; capital, $125,000; to manufacture automobile bodies, limousine tops, etc. Incorporators: Rowland J. Conover, Charles E. Anglim, James T. Gilbert.

BUFFALO, N. Y.—Universal Manufacturing & Carbonator Corporation; capital, $1,000,000; to manufacture automobiles, bicycles, etc. Incorporators: Edward J. Liebetrut, Charles A. Adolff, Henry J. Rosche.

BUFFALO, N. Y.—Willard Commercial Car Company, Inc.; capital, $50,000; to manufacture and deal in commercial motor vehicles, etc. Incorporators: Robert A. Willard, John F. Schamel, Reginald F. Penton.

CHICAGO, ILL.—Lydon Mfg. Company; capital, $25,000; to deal in automobiles, motors and accessories. Incorporators: S. Donahue, F. M. Donahue, W. E. Lyons.

CLEVELAND, O.—Diebold Products Company; capital, $25,000; to manufacture machinery and motor cars. Incorporators: Charles R. Diebold, Max Friedman, Louis P. Diebold, Martin W. Sanders, Mabel M. Hummel.

CLEVELAND, O.—Motor Van Delivery Company; capital, $10,000. Incorporators: Elizabeth Graham Stewart, S. T. Stewart John R. Caunter.

COLUMBUS, O.—New Columbus Automobile Company; capital, $30,000; to manufacture motor vehicles; incorporators: Jesse J. Brown.

COLUMBUS, O.—New Columbus Automobile Company; capital, $30,000; to manufacture and deal in motor vehicles. Incorporators: Jesse J. Brown, Lillian M. Brown, William E. McCannon, Charles E. Dennis, Edson B. Dennis.

DOVER, N. J.—D. & H. Auto Company; capital, $25,000. Incorporators: J. M. Deatrich, J. G. Harris, L. Harris.

FORT WAYNE, IND.—Fox & Shryock Automobile Company; capital, $10,000. Incorporators: George T. Fox, William W. Shryock, Bartlett Shryock.

HUNTINGTON, W. VA.—Jarvis-Huntington Automobile Company; capital, $100,000. Incorporators: Mrs. R. J. Hoster, G. G. Hoster, T. I. Millard, R. D. Esaman, F. C. Pifer.

INDIANAPOLIS, IND.—Simplex Vehicle & Gear Company; capital, $15,000; to manufacture vehicles and parts. Incorporators: Theodore Sanstrom, Maurice M. Kiefer, Samuel S. Helms.

KNOXVILLE, PA.—Hollis Automatic Traction Company; capital, $250,000; to manufacture and deal in motor vehicles.

MORRISTOWN, N. J.—Victor A. Wiss & Brother; capital, $50,000; to do a general automobile business. Incorporators: V. A. Wiss, T. H. Wiss, V. A. Wiss.

NEW YORK, N. Y.—Gotham Sight Seeing Corporation; capital, $1,000; to deal in automobiles and sight-seeing cars. Incorporators: George Laury, Louis Brown, David Lebowitz.

NEW YORK, N. Y.—H. M. S. Motor Company, Inc.; capital, $22,500; to deal in motors, engines, etc. Incorporators: Joseph J. Myers, Charles K. Starr, George P. Harvey.

NEW YORK, N. Y.—Veerac Motor Truck Company; capital, $10,000. Incorporators: Harry B. McGinley, Edward L. Whittemore, George H. Hinnau.

NEW YORK, N. Y.—M. & S. Distributing Company of New York; capital, $3,000; to manufacture and sell motors, engines, etc. Incorporators: Oliver P. Carpenter, Albert D. Bean, George A. Williams.

NEW YORK, N. Y.—Norwalk Motor Car Company of New York; capital, $35,000. Incorporators: P. Lyndon Bryce, Alfred L. Kirby, Edward S. Murphy.

PROVIDENCE, R. I.—Lister, Smith & Walsh Company; capital, $50,000; to manufacture, sell and deal in automobiles.

STRATHROY, ONT.—Royal Motor Company; capital, $500,000; to manufacture automobiles.

# Automobile Incorporations

WHEELING, W. VA.—Lavender Auto Supply Company; capital, $25,000; to do a general automobile and motorcycle business. Incorporators: C. E. Lavender, R. M. Lavender, A. E. Kennard, Sr., Annie Kennard, A. E. Kennard, Jr.

### GARAGES AND ACCESSORIES

BOSTON, MASS.—G. I. M. Vulcanizing Company; capital, $25,000. Incorporators: M. G. Commandy, G. I. Matthews.

BROCKTON, MASS.—City Garage Company; capital, $5,000. Incorporators: Bernard B. Winslow, Daniel Winslow, Arthur W. Curtis.

BROOKLYN, N. Y.—Bensonhurst Auto Renting Company, Inc.; capital, $3,000. Incorporators: Louis Flatow, Harry Harrigan, Max Levey.

BROOKLYN, N. Y.—Yale Motor Cycle Company; capital, $1,000; to do a general motor cycle business. Incorporators: Charles Winkel, Irving M. Levy, Eno M. Levy.

CHICAGO, ILL.—National Tire & Repair Company; capital, $3,000; to do a general automobile repairing business. Incorporator: William E. Eckert.

HAMILTON, O.—Hamilton Taxicab Company; capital, $5,000. Incorporators: J. A. Weigel, Carl A. Weigel, George J. Kalbier, Louise B. Weigel, Caroline Weigel.

INDIANAPOLIS, IND.—Capitol Body Company; capital, $10,000; to manufacture automobile tops and fenders. Incorporators: Elmer Hinshaw, Frederick W. Henschen, Elmer W. Hughey.

INDIANAPOLIS, IND.—Northern Auto Company; capital, $10,000; to do a general garage business. Incorporators: John J. Clements, R. M. Fleming, L. H. Van Briggle.

INDIANAPOLIS, IND.—Simplex Appliance Company; to manufacture motor car lighters. Incorporators: William C. Hamilton, W. Lee Bird, Isaac Born.

LAFAYETTE, IND.—Tippecanoe Auto Club; to encourage persons in Lafayette to obey traffic regulations. Incorporators: Robert L. Sackett, Robert L. Jacques, William P. Heath, Bennet Taylor, Charles W. Hickman.

NEWARK, N. J.—Puncture Cure Sales Company; capital, $30,000; to manufacture devices for repairing tires. Incorporators: H. F. Kirk, F. B. Stewart, C. H. Stewart.

NEW YORK, N. Y.—Auto Center, Inc.; capital, $25,000; to deal in real estate for use in the automobile business, such as garages, show rooms, etc. Incorporators: Edward W. Forrest, Charles H. Fuller, Byron C. Thomas.

NEW YORK, N. Y.—Inter State Motor Express Co., Inc.; capital, $3,000; to operate automobile trucks. Incorporators: George D. Roedels, Joseph L. McGee, Mary M. Fynes.

NEW YORK, N. Y.—John Splitdorf Corporation; capital, $350,000; to manufacture electrical devices, especially for automobiles and gasoline engines. Incorporators: John Splitdorf, P. J. W. Kelley, A. L. Kull.

NEW YORK, N. Y.—Robert Thedford Garage Company, Inc.; capital, $25,000. Incorporators: Robert Thedford, George Glynn, Jaul R. Gordon.

ROCHESTER, N. Y.—Durno Manufacturing Company, Inc.; capital, $100,000; to manufacture mechanical appliances for automobiles. Incorporators: John H. Durno, John F. Turk, Milton Noves.

SAN BENITO, TEX.—Whittlesey Garage & Machinery Company; capital, $25,000. Incorporators: C. W. Whittlesey, James T. Valentine, J. Valentine.

TOLEDO, O.—Parsons Manufacturing Company; capital, $10,000; to manufacture automobile appliances and other novelties. Incorporators: George E. Seney, Irving E. Austin, Charles W. Parsons, Henry Parsons, H. F. Kier.

UNIONTOWN, PA.—Auto Service Company; capital, $5,000. Incorporators: C. W. Johnson, Fred A. Close, F. B. Hess, R. M. Campbell, Max Hannan, E. Gadd Snyder, J. C. Donahue, G. T. Love, D. D. Haroder, A. E. Corns.

WILMINGTON, DEL.—Colonial Tire & Rubber Co.; capital, $250,000. Incorporators: F. D. Buck, G. W. Dillman, B. M. Grawl.

### CHANGES OF NAME AND CAPITAL

MIDDLETOWN, O.—Miami Cycle Mfg. Company; capital increased from $1,000,000 to $2,000,000.

TOLEDO, O.—Landmann-Griffith Motor Company; capital increased from $10,000 to $20,000.

**Opens Supply Store**—The Universal Auto Company, which heretofore has conducted a repair business, has opened a supply store in the new motor mart, Hartford, Conn.

**Colgan Goes to Milwaukee**—Henry Colgan, formerly head of the Waverley Electric Company's Louisville, Ky., office, will hereafter be in charge of Waverley sales in Milwaukee, Wis.

**Alabama Fees $64,489**—Sale of automobile licenses in Alabama has totaled $64,489 to date. Of this sum the state receives 60 per cent. The remainder is divided between the cities and counties.

**L. I. A. C. Run to Count**—The informal run to be held on Washington's birthday by the Long Island Automobile Club will be counted in the competition for the trophy to be awarded to the members taking part in competitions throughout the season.

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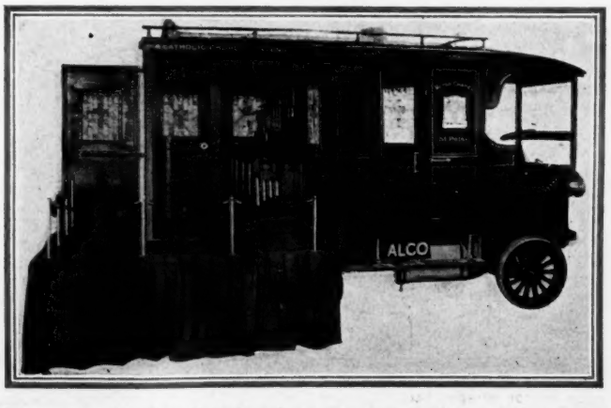
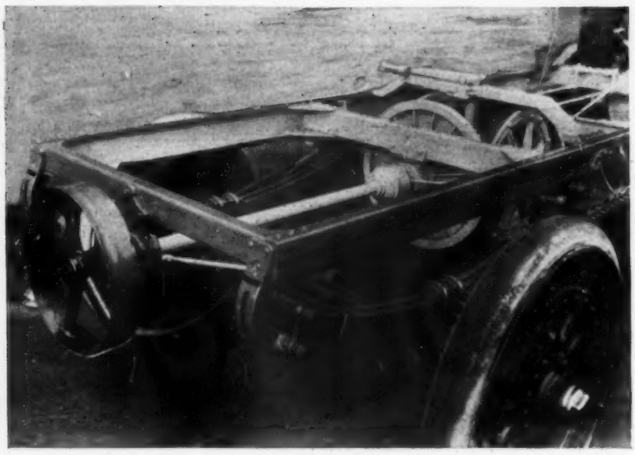



Alco motor chapel as it looks when open and ready for use, showing the altar



Rear view of Service truck, shown at Chicago, with its cushion wheels and pulley attachment for driving machinery

**Plumb Sales Manager**—F. W. Plumb has joined the Palmer-Moore Motor Truck Company, Syracuse, N. Y., as sales manager.

**Hall Universal Manager**—H. W. Hall has been appointed manager of the Boston, Mass., branch of the Universal Motor Truck Company.

**Syracuse Club's Banquet**—The Automobile Club of Syracuse, N. Y., is planning its annual banquet for March 6 in the ballroom of the Onondaga.

**Crockett Locomobile Truck Manager**—Frank Crockett has been appointed manager of the truck department of the Locomobile's Boston, Mass., branch.

**Futtermans Control Superior Lamp**—Harry, Myer and Abraham Futterman have taken over the control of the Superior Lamp Manufacturing Company, New York City.

**Sarles Elected President**—The North Dakota division of the Meridian Road Association has re-elected former Governor E. Y. Sarles as president and C. W. Graves as secretary.

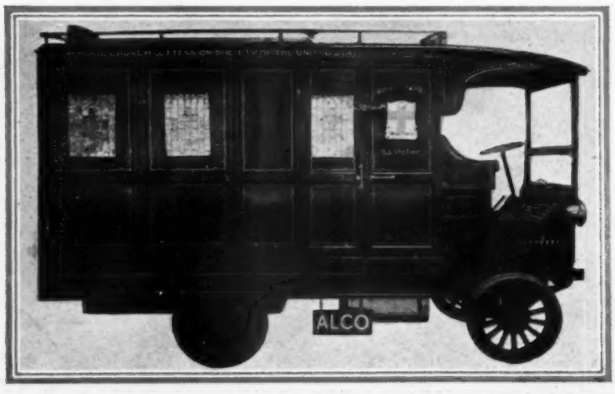
**Dart to Conduct Shows**—F. W. Dart has completed an organization that will conduct shows throughout the country next season. Mr. Dart managed the recent Hartford, Conn., show.

**Lakeside Show in April**—The automobile dealers of the neighboring city of Auburn, N. Y., are planning for their annual show in the pavilion at Lakeside early in April. Details are now being perfected.

**Harrisburg Club Elects**—The Harrisburg Motor Club, Harrisburg, Pa., recently elected the following officers: W. E. Lauver, president; F. H. Bomgardner, vice-president, and J. C. Myton, secretary-treasurer.

**Pope Chemical Wagons Ordered**—Two chemical wagons have been ordered of the Pope Manufacturing Company, Hartford, Conn., by the Worcester, Mass., fire department. This will make three machines of this type in service.

**Bus Line in Lancaster**—W. A. Arnold has purchased an automobile and will operate a bus line from Lancaster, Ky., to Nicholasville, Ky. This makes the second automobile line which has been put into operation between the two cities.




Alco motor chapel built for the Catholic Church Extension Society, showing the chapel closed

**Denison Advertising Manager**—G. H. Denison has assumed the post of advertising manager with the Dyneto Electric Company, the factory being at Elbridge and the business and sales office at No. 200 East Genesee street, Syracuse, N. Y.

**Ithaca Wants Fire Trucks**—A committee headed by City Judge Daniel Crowley has requested the fire commissioners of the city of Ithaca, N. Y., to recommend to the common council of that city the purchase of a combination hose and chemical automobile.

**Lageson's Anti-Skid Cover**—K. J. Lageson, Benson, Minn., has patented an anti-skid cover for vehicle wheels, to prevent skidding. It is to provide a chain tread of novel construction consisting of links shaped to fit the tread of the tire and having integral loop portions on two sides of the links that form projections, engaging the road surface and preventing side slipping.

**Concrete Road Proves Success**—C. E. Gordon, member of American Society of Chemical Engineers and official representative of the war department, recently spent several days at Fond du Lac, Wis., to inspect and investigate concrete street pavement, of which type that city has laid thousands of square yards, being a pioneer in the use of concrete for pavements. He was able to gain valuable information as to the durability of this type of paving, for the reason that some of it has been down for more than three and one-half years.

# Automobile Incorporations

## AUTOMOBILES AND PARTS

ALTOONA, PA.—Keystone Motor Car Company; capital, $10,000; to deal in cars, and to carry on a general automobile garage and repair business. Incorporators: Albert E. Akers, president.

AUGUSTA, ME.—American Automatic Protective Valve Company; capital, $400,000; to manufacture, sell and deal in valves and other devices. Incorporators: R. S. Buzzell, L. J. Coleman.

BROOKVILLE, O.—Brookville Auto Company; capital, $10,000. Incorporators: J. Ward Somers, Edward S. Somers, V. T. Somers.

BUFFALO, N. Y.—Conover Limousine Top Company, Inc.; capital, $125,000; to manufacture automobile bodies, limousine tops, etc. Incorporators: Rowland J. Conover, Charles E. Anglim, James T. Gilbert.

BUFFALO, N. Y.—Universal Manufacturing & Carbonator Corporation; capital, $1,000,000; to manufacture automobiles, bicycles, etc. Incorporators: Edward J. Liebetrut, Charles A. Adolff, Henry J. Rosche.

BUFFALO, N. Y.—Willard Commercial Car Company, Inc.; capital, $50,000; to manufacture and deal in commercial motor vehicles, etc. Incorporators: Robert A. Willard, John F. Schamel, Reginald F. Penton.

CHICAGO, ILL.—Lydon Mfg. Company; capital, $25,000; to deal in automobiles, motors and accessories. Incorporators: S. Donahue, F. M. Donahue, W. E. Lyons.

CLEVELAND, O.—Diebold Products Company; capital, $25,000; to manufacture machinery and motor cars. Incorporators: Charles R. Diebold, Max Friedman, Louis P. Diebold, Martin W. Sanders, Mabel M. Hummel.

CLEVELAND, O.—Motor Van Delivery Company; capital, $10,000. Incorporators: Elizabeth Graham Stewart, S. T. Stewart John R. Caunter.

COLUMBUS, O.—New Columbus Automobile Company; capital, $30,000; to manufacture motor vehicles; incorporators: Jesse J. Brown.

COLUMBUS, O.—New Columbus Automobile Company; capital, $30,000; to manufacture and deal in motor vehicles. Incorporators: Jesse J. Brown, Lillian M. Brown, William E. McCannon, Charles E. Dennis, Edson B. Dennis.

DOVER, N. J.—D. & H. Auto Company; capital, $25,000. Incorporators: J. M. Deatrich, J. G. Harris, L. Harris.

FORT WAYNE, IND.—Fox & Shryock Automobile Company; capital, $10,000. Incorporators: George T. Fox, William W. Shryock, Bartlett Shryock.

HUNTINGTON, W. VA.—Jarvis-Huntington Automobile Company; capital, $100,000. Incorporators: Mrs. R. J. Hoster, G. G. Hoster, T. I. Millard, R. D. Esaman, F. C. Pifer.

INDIANAPOLIS, IND.—Simplex Vehicle & Gear Company; capital, $15,000; to manufacture vehicles and parts. Incorporators: Theodore Sanstrom, Maurice M. Kiefer, Samuel S. Helms.

KNOXVILLE, PA.—Hollis Automatic Traction Company; capital, $250,000; to manufacture and deal in motor vehicles.

MORRISTOWN, N. J.—Victor A. Wiss & Brother; capital, $50,000; to do a general automobile business. Incorporators: V. A. Wiss, T. H. Wiss, V. A. Wiss.

NEW YORK, N. Y.—Gotham Sight Seeing Corporation; capital, $1,000; to deal in automobiles and sight-seeing cars. Incorporators: George Laury, Louis Brown, David Lebowitz.

NEW YORK, N. Y.—H. M. S. Motor Company, Inc.; capital, $22,500; to deal in motors, engines, etc. Incorporators: Joseph J. Myers, Charles K. Starr, George P. Harvey.

NEW YORK, N. Y.—Veerac Motor Truck Company; capital, $10,000. Incorporators: Harry B. McGinley, Edward L. Whittemore, George H. Hinnau.

NEW YORK, N. Y.—M. & S. Distributing Company of New York; capital, $3,000; to manufacture and sell motors, engines, etc. Incorporators: Oliver P. Carpenter, Albert D. Bean, George A. Williams.

NEW YORK, N. Y.—Norwalk Motor Car Company of New York; capital, $35,000. Incorporators: P. Lyndon Bryce, Alfred L. Kirby, Edward S. Murphy.

PROVIDENCE, R. I.—Lister, Smith & Walsh Company; capital, $50,000; to manufacture, sell and deal in automobiles.

STRATHROY, ONT.—Royal Motor Company; capital, $500,000; to manufacture automobiles.

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WHEELING, W. VA.—Lavender Auto Supply Company; capital, $25,000; to do a general automobile and motorcycle business. Incorporators: C. E. Lavender, R. M. Lavender, A. E. Kennard, Sr., Annie Kennard, A. E. Kennard, Jr.

### GARAGES AND ACCESSORIES

BOSTON, MASS.—G. I. M. Vulcanizing Company; capital, $25,000. Incorporators: M. G. Commandy, G. I. Matthews.

BROCKTON, MASS.—City Garage Company; capital, $5,000. Incorporators: Bernard B. Winslow, Daniel Winslow, Arthur W. Curtis.

BROOKLYN, N. Y.—Bensonhurst Auto Renting Company, Inc.; capital, $3,000. Incorporators: Louis Flatow, Harry Harrigan, Max Levey.

BROOKLYN, N. Y.—Yale Motor Cycle Company; capital, $1,000; to do a general motor cycle business. Incorporators: Charles Winkel, Irving M. Levy, Eno M. Levy.

CHICAGO, ILL.—National Tire & Repair Company; capital, $3,000; to do a general automobile repairing business. Incorporator: William E. Eckert.

HAMILTON, O.—Hamilton Taxicab Company; capital, $5,000. Incorporators: J. A. Weigel, Carl A. Weigel, George J. Kalbier, Louise B. Weigel, Caroline Weigel.

INDIANAPOLIS, IND.—Capitol Body Company; capital, $10,000; to manufacture automobile tops and fenders. Incorporators: Elmer Hinshaw, Frederick W. Henschen, Elmer W. Hughey.

INDIANAPOLIS, IND.—Northern Auto Company; capital, $10,000; to do a general garage business. Incorporators: John J. Clements, R. M. Fleming, L. H. Van Briggle.

INDIANAPOLIS, IND.—Simplex Appliance Company; to manufacture motor car lighters. Incorporators: William C. Hamilton, W. Lee Bird, Isaac Born.

LAFAYETTE, IND.—Tippecanoe Auto Club; to encourage persons in Lafayette to obey traffic regulations. Incorporators: Robert L. Sackett, Robert L. Jacques, William P. Heath, Bennet Taylor, Charles W. Hickman.

NEWARK, N. J.—Puncture Cure Sales Company; capital, $30,000; to manufacture devices for repairing tires. Incorporators: H. F. Kirk, F. B. Stewart, C. H. Stewart.

NEW YORK, N. Y.—Auto Center, Inc.; capital, $25,000; to deal in real estate for use in the automobile business, such as garages, show rooms, etc. Incorporators: Edward W. Forrest, Charles H. Fuller, Byron C. Thomas.

NEW YORK, N. Y.—Inter State Motor Express Co., Inc.; capital, $3,000; to operate automobile trucks. Incorporators: George D. Roedels, Joseph L. McGee, Mary M. Fynes.

NEW YORK, N. Y.—John Splitdorf Corporation; capital, $350,000; to manufacture electrical devices, especially for automobiles and gasoline engines. Incorporators: John Splitdorf, P. J. W. Kelley, A. L. Kull.

NEW YORK, N. Y.—Robert Thedford Garage Company, Inc.; capital, $25,000. Incorporators: Robert Thedford, George Glynn, Jaul R. Gordon.

ROCHESTER, N. Y.—Durno Manufacturing Company, Inc.; capital, $100,000; to manufacture mechanical appliances for automobiles. Incorporators: John H. Durno, John F. Turk, Milton Noves.

SAN BENITO, TEX.—Whittlesey Garage & Machinery Company; capital, $25,000. Incorporators: C. W. Whittlesey, James T. Valentine, J. Valentine.

TOLEDO, O.—Parsons Manufacturing Company; capital, $10,000; to manufacture automobile appliances and other novelties. Incorporators: George E. Seney, Irving E. Austin, Charles W. Parsons, Henry Parsons, H. F. Kier.

UNIONTOWN, PA.—Auto Service Company; capital, $5,000. Incorporators: C. W. Johnson, Fred A. Close, F. B. Hess, R. M. Campbell, Max Hannan, E. Gadd Snyder, J. C. Donahue, G. T. Love, D. D. Haroder, A. E. Corns.

WILMINGTON, DEL.—Colonial Tire & Rubber Co.; capital, $250,000. Incorporators: F. D. Buck, G. W. Dillman, B. M. Grawl.

### CHANGES OF NAME AND CAPITAL

MIDDLETOWN, O.—Miami Cycle Mfg. Company; capital increased from $1,000,000 to $2,000,000.

TOLEDO, O.—Landmann-Griffith Motor Company; capital increased from $10,000 to $20,000.

**Opens Supply Store**—The Universal Auto Company, which heretofore has conducted a repair business, has opened a supply store in the new motor mart, Hartford, Conn.

**Colgan Goes to Milwaukee**—Henry Colgan, formerly head of the Waverley Electric Company's Louisville, Ky., office, will hereafter be in charge of Waverley sales in Milwaukee, Wis.

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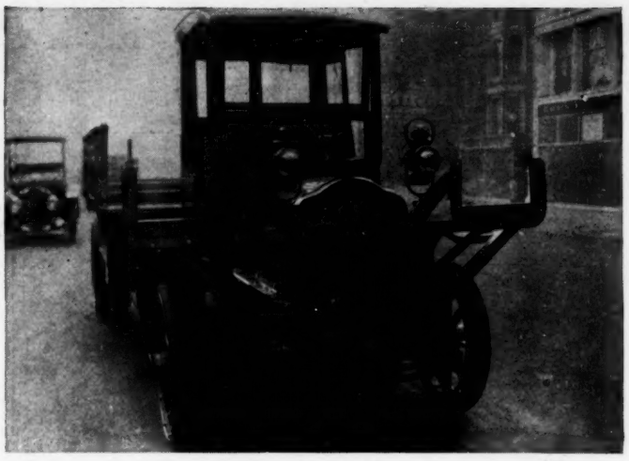

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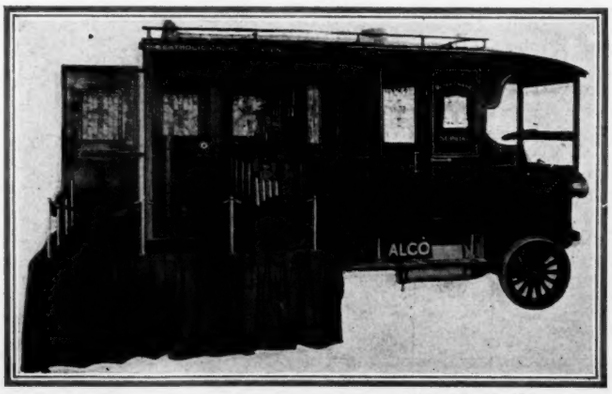


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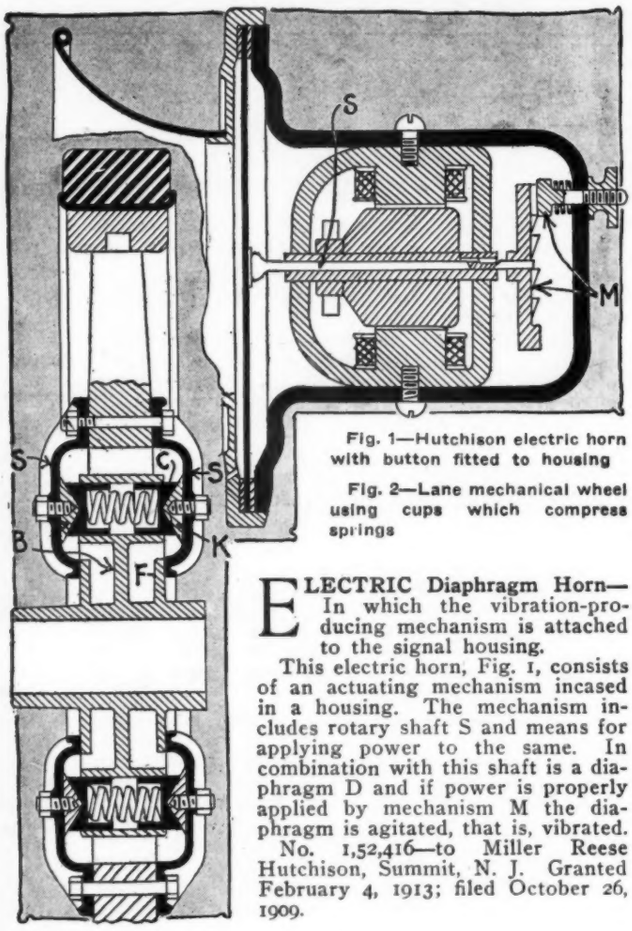


Fig. 1—Hutchison electric horn with button fitted to housing

Fig. 2—Lane mechanical wheel using cups which compress springs

**ELECTRIC Diaphragm Horn**—In which the vibration-producing mechanism is attached to the signal housing.

This electric horn, Fig. 1, consists of an actuating mechanism incased in a housing. The mechanism includes rotary shaft S and means for applying power to the same. In combination with this shaft is a diaphragm D and if power is properly applied by mechanism M the diaphragm is agitated, that is, vibrated.

No. 1,52,416—to Miller Reese Hutchison, Summit, N. J. Granted February 4, 1913; filed October 26, 1909.

**Spring Wheel**—To the hub of which parallel radial flanges are attached, between which the springs are in place.

In this wheel, Fig. 2, the hub carries two flat radial flanges F, a series of transverse bosses B extending between and radially beyond the flanges. The body of the wheel includes two side-plates S which embrace the bosses and co-operate slidably with the flanges. A series of cup pairs—cups C—are mounted for transverse slidable movement in the bosses, cones K being carried by the side-plates and co-operating with the cups. A spring between each pair of cups tends to force them apart in their co-operation with the cones.

No. 1,052,350—to Victor Edward Lane, Brooklyn, N. Y. Granted February 4, 1913; filed April 3, 1912.

**Resilient Tire**—Convolute springs take the place of air.

The rim R of this tire has a bracket B secured to its outer circumference, the bracket being of the cross-section shown in Fig. 3 formed with outwardly extending ends through which a pair of rods Q supporting spring bows S are laid.

No. 1,051,939—to Paul F. Wobst, Milwaukee, Wis. Granted February 4, 1913; filed August 6, 1912.

**Multiple-Elliptic Spring**—Consisting of several semi-independent spring units.

The spring suspension described in this patent, Fig. 4, consists of a number of sections S which are connected to a frame F and an axle A, by means of hangers H to which they are connected.

No. 1,052,233—to Phelps M. Freer, Detroit, Mich. Granted February 4, 1913; filed March 31, 1911.

**Bumper Bracket**—Consisting of doubly slotted members which hold on to the frame without bolts piercing the latter.

This bracket B, Fig 5, designed to support a bumper bar, is provided with a lug L adapted to engage the end of an automobile-frame side bar. A clamping member with an aperture is connected with B by a bolt E passing through that aperture.

No. 1,052,224—to Grant F. Discher, Milwaukee, Wis. Granted February 4, 1913; filed April 11, 1910.

**Variable-Stroke Engine**—A grooved cam varies the stroke.

The crankshaft S, Fig. 6, carries disks D on opposite sides of R. Adjacent disk faces are formed with parallel cam grooves. Disks are connected by pin P, having sliding engagement with R. Pin Q is guided by the groove and varies the piston stroke.

No. 1,051,917—to Ralph C. Root, Penlan, Va. Granted February 4, 1913; filed June 12, 1911.

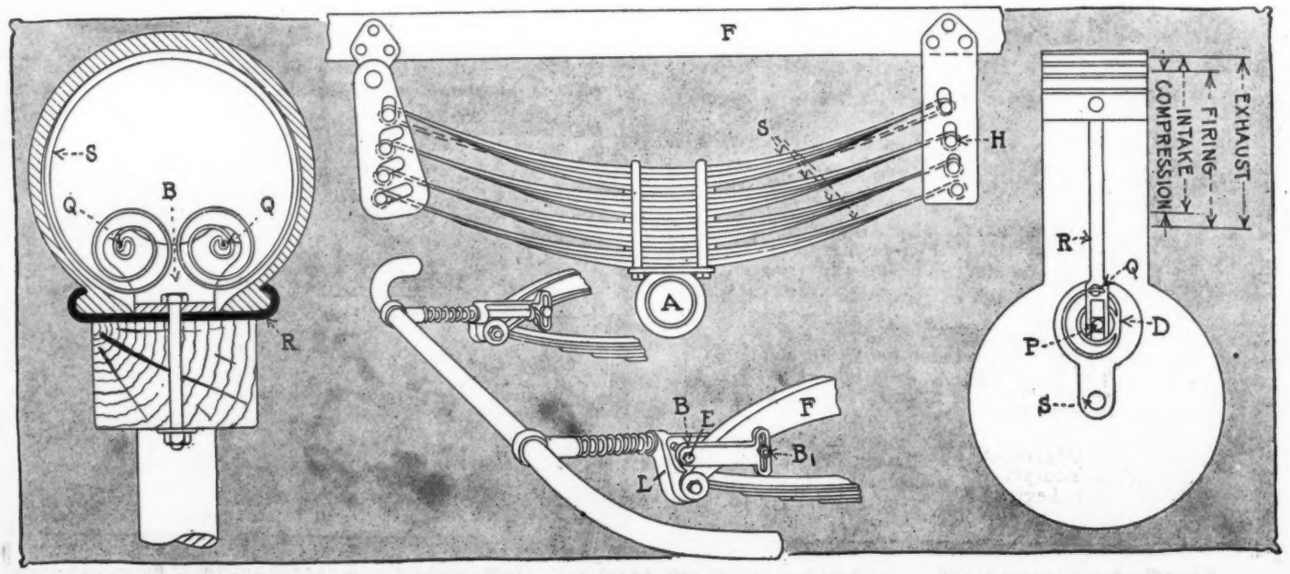


Fig. 3—Wobst resilient tire. Fig. 4—Freer spring. Fig. 5—Discher bumper bracket. Fig. 6—Root variable-stroke engine